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EPA Superfund
Record of Decision:

CHARLES MACON LAGOON AND DRUM STORAGE
EPA ID: NCD980840409
OU 01
CORDOVA, NC
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09/30/91
REGIONAL ADMINISTRATOR

#SNLD
1. SITE NAME, LOCATION AND DESCRIPTION

THE CHARLES MACON LAGOON AND DRUM STORAGE SITE AND THE DOCKERY SITE, COLLECTIVELY REFERRED TO AS THE MACON/DOCKERY SITE, LOCATED IN THE RICHMOND COUNTY, NORTH CAROLINA, WAS OPERATED AS A WASTE OIL RECYCLING AND ANTIFREEZE MANUFACTURING FACILITY FROM 1979 TO 1982. THE SITE IS LOCATED APPROXIMATELY 1 MILE EAST OF THE PEE DEE RIVER AND 1.6 MILES SOUTHWEST OF CORDOVA, NORTH CAROLINA ON STATE ROAD (SR) 1103. THE LAND BETWEEN THE SITE AND THE RIVER CONSTITUTES A WETLANDS AREA AND CONTAINS THE NEAREST DOWNSLOPE STREAM, 1,050 FEET FROM THE SITE. THE SITE IS PARTIALLY BORDERED TO THE SOUTH BY A FENCE SEPARATING WOODS AND FARMLAND, TO THE EAST BY SR 1103; AND TO THE NORTH BY WOODS AND FARMLAND. AS INDICATED ON FIGURE 1, THE SITE COMPRISES TWO NON-CONTIGUOUS, INDEPENDENTLY OWNED PARCELS OF LAND: A 16-ACRE TRACT OWNED BY RELATIVES AND HEIRS OF CHARLES MACON, AND A ONE-ACRE TRACT OWNED BY JOHN DOCKERY. THE DOCKERY PROPERTY IS LOCATED APPROXIMATELY 2,600 FEET NORTH OF THE MACON PROPERTY ON THE WEST SIDE OF SR 1103. THE MACON SITE IS LOCATED AT 34 DEGREES 53 MINUTES 30 SECONDS NORTH LATITUDE, 79 DEGREES 50 MINUTES 18 SECOND WEST LONGITUDE, AND THE DOCKERY SITE IS LOCATED AT 34 DEGREES 53 MINUTES 52 SECONDS NORTH LATITUDE, 79 DEGREES 50 MINUTES 18 SECONDS WEST LONGITUDE.

FOR REFERENCE PURPOSES, THE MACON AND DOCKERY SITES HAVE BEEN DIVIDED INTO THE UPPER AND LOWER MACON SITES AND THE UPPER AND LOWER DOCKERY SITES (FIGURES 2 AND 3, RESPECTIVELY). THE UPPER SITE IN EACH CASE IS LOCATED ADJACENT TO SR 1103 WHICH FOLLOWS A TOPOGRAPHIC RIDGE EAST OF THE SITES. THE LOWER SITE IN EACH CASE IS LOCATED TOPOGRAPHICALLY DOWNGRADIENT AND WEST OF THE UPPER SITE.

A. SITE DESCRIPTION

THE MACON PROPERTY IS APPROXIMATELY 60 PERCENT WOODED. SEVERAL CLEARED AREAS ARE PRESENT AT THE MACON SITE WHERE DRUM STORAGE AREAS, THREE UNUSED SURFACE IMPOUNDMENTS, AND 11 OIL/WATER WASTE STORAGE LAGOONS WERE LOCATED. AS INDICATED ON FIGURE 2, MOST OF THE WASTE LAGOONS (LAGOONS 1 THROUGH 9) WERE LOCATED IN CLEARED TREES ON THE UPPER MACON SITE. TWO WASTE STORAGE LAGOONS (LAGOONS 10 AND 11) WERE LOCATED ON THE SOUTHWEST PORTION OF THE LOWER MACON SITE. THREE EMPTY AND UNUSED SURFACE IMPOUNDMENTS WERE LOCATED IN THE NORTHERN PORTION OF THE LOWER MACON SITE (FIGURE 2). IN ADDITION TO THE ABOVE, 4 BUILDINGS TWO TRUCKS TANKERS, 1 BOX TRAILER AND 13 TANKS REMAIN ON THE UPPER MACON SITE ALONG WITH 1 TANK AT THE LOWER MACON SITE.

THE DOCKERY PROPERTY IS WOODED WITH FEW CLEARED AREAS (FIGURE 3). A SINGLE UNPAVED ROAD PROVIDES ACCESS TO THE SITE FROM SR 1103. ONE WASTE LAGOON (LAGOON 12 AT LOWER DOCKERY), AS WELL AS SEVERAL DRUM STORAGE AREAS WERE LOCATED IN CLEARINGS ON THE DOCKERY SITE. DRUM STORAGE PRIMARILY OCCURRED AT THE CLEARED AREA THAT FORMS THE UPPER DOCKERY SITE.

B. TOPOGRAPHY

THE AREA WHERE THE MACON AND DOCKERY SITES ARE LOCATED LIES ON THE WESTERN MARGIN OF THE SANDHILLS REGION OF THE INNER COASTAL PLAIN PHYSIOGRAPHIC PROVINCE. THE TOPOGRAPHY IN THIS AREA IS GENERALLY SMOOTH WITH EXTENSIVE GENTLY ROLLING INTERSTREAM AREAS. THE SITE SLOPES TOWARD THE PEE DEE RIVER FROM AN APPROXIMATE ELEVATION OF 275 FEET ABOVE MEAN SEA LEVEL (MSL) TO APPROXIMATELY 160 FEET ABOVE MSL AT THE WESTERN BOUNDARY OF THE SITES. ALONG THE PEE DEE RIVER, THE TOPOGRAPHY BECOMES MORE RUGGED WITH DEEPLY DISSECTED STREAM VALLEYS WHERE TRIBUTARIES FLOW INTO THE RIVER. A BROAD, FLAT ALLUVIAL PLAIN APPROXIMATELY 2,000 FEET WIDE IS LOCATED ABOUT 1,000 FEET WEST OF THE SITE ADJACENT TO THE PEE DEE RIVER.

C. GEOLOGY

THE SITES ARE LOCATED IN THE PEE DEE RIVER BASIN NEAR THE COASTAL PLAIN/PIEDMONT PHYSIOGRAPHIC BOUNDS. BASED ON BOREHOLE LOGS AND THE OBSERVATION OF BEDROCK OUTCROPPINGS, THE LAYER OF RESIDUAL SOIL AND SAPROLITE ON COMPETENT BEDROCK AT THE SITE IS ESTIMATED AT 30 TO 95 FEET THICK. RESIDUAL SOILS ARE THICKEST IN THE AREA OF THE UPPER MACON AND DOCKERY SITES AND THIN WESTWARD WITH INCREASING PROXIMITY TO THE PEE DEE RIVER. THE UNSATURATED ZONE OF SOIL (ALSO CALLED THE VADOSE ZONE) RANGES FROM 25 TO 35 FEET THICK. THE BEDROCK IS GRANITE AND GNEISS.

D. SOILS

THE MACON/DOCKERY SITE LIES ALMOST DIRECTLY ON THE PIEDMONT-COASTAL PLAIN SOIL PROVINCE BOUNDARY. THE SOILS IN THE AREA CONSIST OF GROUPS COMMON TO BOTH PROVINCES. THESE INCLUDE THE CECIL AND IREDELL SOILS OF THE PIEDMONT PROVINCE AND THE NORFOLK, ORANGEBURG, AND GREENVILLE SOILS OF THE COASTAL PLAIN PROVINCE.

E. SURFACE WATER HYDROLOGY

SURFACE WATER AND STORM RUNOFF ON THE MACON SITE PRIMARILY DRAINS TO THE WEST IN THE DIRECTION-OF SOLOMON'S CREEK (FIGURE 1). WATER WHICH EXITS THE NORTHERN PORTION OF THE MACON SITE ENTERS EITHER A SMALL POND LOCATED IN THE WESTERN PORTION OF THE LOWER MACON SITE OR AN UNNAMED FIRST ORDER TRIBUTARY TO SOLOMON'S CREEK WATER FLOWING FROM THE SOUTHERN PORTION OF THE MACON SITE AND THE SMALL POND ENTERS SOLOMON'S CREEK. SOLOMON'S CREEK ENTERS THE PEE DEE RIVER APPROXIMATELY TWO MILES DOWNSTREAM FROM WHERE SITE RUNOFF ENTERS SOLOMON'S CREEK.

SURFACE WATER RUNOFF FROM THE DOCKERY SITE FLOWS VIA NUMEROUS GULLIES AND INTERMITTENT STREAMS. WATER LEAVING THE NORTHERN PORTION OF THE DOCKERY SITE ENTERS A WESTWARD-FLOWING TRIBUTARY TO THE PEE DEE RIVER. THAT TRIBUTARY ENTERS THE PEE DEE RIVER APPROXIMATELY ONE MILE WEST OF THE DOCKERY SITE. WATER LEAVING THE SOUTHERN PORTION OF THE DOCKERY SITE ENTERS THE SAME UNNAMED TRIBUTARY TO SOLOMON'S CREEK AS WATER LEAVING THE NORTHERN PORTION OF THE MACON SITE. WATER FROM THE DOCKERY SITE ENTERS THE TRIBUTARY APPROXIMATELY ONE-HALF MILE UPSTREAM OF THE MACON SITE.

F. HYDROGEOLOGY

FOUR DISTINCT HYDROGEOLOGIC UNITS WERE ENCOUNTERED AT THE MACON/DOCKERY SITE DURING THE RI. THESE UNITS ARE DISTINGUISHED PRIMARILY BY DIFFERENCES IN LITHOLOGY AND ALSO BY DIFFERENCES IN RELATIVE PERMEABILITIES. IN ORDER OF DESCENDING DEPTH, THESE UNITS INCLUDE (1) A PERCHED WATER TABLE, (2) A SHALLOW SAPROLITE UNIT, (3) A TRANSITION ZONE OF PARTIALLY WEATHERED ROCK, AND (4) A BEDROCK UNIT. THE SHALLOW SAPROLITE UNIT, TRANSITION ZONE, AND BEDROCK ARE LIKELY TO BE HYDRAULICALLY INTERCONNECTED AS NO APPARENT LATERALLY EXTENSIVE CONFINING LAYER WAS OBSERVED. BASED ON DATA OBTAINED FROM BOTH THE MACON AND DOCKERY SITES AND IN VIEW OF THEIR CLOSE PROXIMITY, THE HYDROGEOLOGY OF THE TWO SITES APPEARS TO BE SIMILAR. ALL MONITORING WELLS ARE SCREENED IN THE SAPROLITE OR IN THE TRANSITION ZONE. HYDROGEOLOGIC CROSS SECTIONS FOR THE MACON SITE ARE SHOWN IN FIGURE 4.

EVIDENCE OF A PERCHED WATER TABLE WAS OBSERVED DURING DRILLING AND TEST PIT EXCAVATION ACTIVITIES AT THE UPPER AND LOWER MACON SITE AND DURING DRILLING ACTIVITIES AT THE UPPER DOCKERY SITE. WHEN ENCOUNTERED, THE PERCHED WATER TABLE WAS PRESENT AS A THIN, LATERALLY DISCONTINUOUS HORIZON OF SATURATED SOILS. PERCHED WATER CONTAINED IN THIS UNIT IS BELIEVED TO RECHARGE THE UNDERLYING SHALLOW SAPROLITE AQUIFER.

DEPTH TO THE PERCHED WATER TABLE IS ESTIMATED TO RANGE FROM 14 TO 20 FEET. THE SATURATED THICKNESS OF THE PERCHED WATER TABLE IS ESTIMATED TO BE APPROXIMATELY 1 TO 2 FEET. ALTHOUGH HYDRAULIC CONDUCTIVITY (K) WAS NOT MEASURED, ATTEMPTS TO PRODUCE WATER FROM THIS INTERVAL WHILE DRILLING THE BOREHOLE FOR MW-10 INDICATE THAT THE YIELD OF THE PERCHED WATER TABLE IS EXTREMELY LOW.

AN UNCONFINED, SHALLOW SAPROLITE UNIT IS PRESENT THROUGHOUT MOST OF THE MACON/DOCKERY SITE, EXCEPT WHERE PARTIALLY WEATHERED ROCK OR BEDROCK IS EXPOSED AT LAND SURFACE. THIS UNIT COMPRISES THE WATER TABLE AQUIFER THROUGHOUT MOST OF THE SITE AND IS GENERALLY ENCOUNTERED BETWEEN 20 TO 35 FEET BELOW LAND SURFACE. DEPTH TO THE WATER TABLE GENERALLY DECREASES WITH INCREASING PROXIMITY TO THE PEE DEE RIVER. THE SATURATED THICKNESS OF THE SHALLOW SAPROLITE UNIT IS APPROXIMATELY 20 TO 30 FEET.

THE LATERAL COMPONENT OF GROUNDWATER FLOW FOR THE SHALLOW SAPROLITE UNIT AT THE SITE IS, IN GENERAL, TO THE WEST-NORTHWEST WITH AN APPROXIMATE HYDRAULIC GRADIENT OF 0.07. A POTENTIOMETRIC MAP ILLUSTRATING THE CONFIGURATION OF THE WATER TABLE AT THE MACON AND DOCKERY SITES IS PROVIDED ON FIGURES 5 AND 6. WATER TABLE CONFIGURATION APPROXIMATELY PARALLELS SITE TOPOGRAPHY. THUS, THE TOPOGRAPHIC RIDGE WHICH PARALLELS SR 1103 IS BELIEVED TO ACT AS A HYDRAULIC DIVIDE FOR LOCAL GROUNDWATER FLOW.

HYDRAULIC CONDUCTIVITIES OBTAINED FROM SLUG TESTS CONDUCTED IN 12 WELLS IN THE SHALLOW SAPROLITE UNIT RANGED FROM 0.07 FT/DAY TO 16.71 FT/DAY WITH AN ARITHMETIC AVERAGE OF APPROXIMATELY 2.4 FT/DAY. HYDRAULIC CONDUCTIVITIES IN MW-05 (6.71 FT/DAY) AND MW-07 (16.71 FT/DAY) WERE MUCH GREATER THAN THE OTHER SHALLOW WELLS TESTED (LESS THAN 3.0 FT/DAY) AND THEREFORE, THE ARITHMETIC AVERAGE OF 2.4 FT/DAY IS CONSIDERED HIGH. CONSEQUENTLY, THE MORE APPROPRIATE GEOMETRIC AVERAGE FOR THESE 12 WELLS IS 0.55 FT/DAY. THESE DIFFERENCES IN HYDRAULIC CONDUCTIVITY REFLECT THE ANISOTROPIC AND HETEROGENOUS CHARACTER OF THE UNIT.

A TRANSITION ZONE OF PARTIALLY WEATHERED ROCK SEPARATES THE SAPROLITE AND BEDROCK UNITS. GEOLOGIC LOGS INDICATE THAT THIS ZONE HAS AN APPROXIMATE THICKNESS OF 5 TO 20 FEET. THE GROUNDWATER FLOW DIRECTION IN THE TRANSITION ZONE APPEARS TO BE IN A WESTERLY/NORTHWESTERLY DIRECTION TOWARDS THE PEE DEE RIVER.

HYDRAULIC CONDUCTIVITIES CALCULATED FROM SLUG TESTS PERFORMED IN THE 4 WELLS SCREENING THIS UNIT RANGE FROM 0.34 FT/DAY (MW-08A) TO 22.19 FT/DAY (MW-02A), WITH AN AVERAGE VALUE OF 7.64 FT/DAY. THESE VARIANCES ARE BELIEVED TO INDICATE THAT THE HYDRAULIC CHARACTERISTICS OF THIS UNIT ARE HETEROGENOUS AND ANISOTROPIC. CONSIDERING THE FINE-GRAINED SIZE OF THE MATERIALS COMPOSING THE UNIT, THE OBSERVED MAXIMUM VALUE FOR HYDRAULIC CONDUCTIVITY OF 22.19 FT/DAY EXISTS IN LOCALIZED AREAS OF LIMITED EXTENT.

HORIZONTAL GROUNDWATER FLOW VELOCITIES FOR BOTH THE MACON AND DOCKERY SITES WERE ESTIMATED USING THE GEOMETRIC MEAN OF HYDRAULIC CONDUCTIVITIES AND THE AVERAGE (ARITHMETIC) HYDRAULIC GRADIENT ACROSS EACH SITE. THE GEOMETRIC MEAN FOR HYDRAULIC CONDUCTIVITY WAS CONSIDERED TO BE THE MOST REPRESENTATIVE FOR THE ENTIRE FLOW REGIME DUE TO APPARENT HETEROGENEOUS AND ANISOTROPIC CONDITIONS INDICATED BY THE SLUG TEST RESULTS.

THE GEOMETRIC MEAN CALCULATED FROM SLUG TEST DATA ON 16 WELLS IS 0.82 FT/DAY. USING AN ARITHMETIC AVERAGE HYDRAULIC GRADIENT FOR THE MACON SITE OF 0.05 FT/FT, THE ESTIMATED GROUNDWATER VELOCITY FOR THE MACON SITE IS 0.21 FT/DAY. FOR THE DOCKERY SITE, THE ESTIMATED GROUNDWATER VELOCITY IS 0.16 FT/DAY (ARITHMETIC AVERAGE HYDRAULIC GRADIENT OF 0.04 FT/FT)

BEDROCK OF REGIONAL EXTENT UNDERLIES THE PERCHED WATER TABLE, SAPROLITE UNIT, AND TRANSITION ZONE. THIS AQUIFER IS PREDOMINANTLY COMPOSED OF GRANITE, ALTHOUGH IT MAY GRADE INTO GNEISS AT CERTAIN LOCALITIES. NO SITE-SPECIFIC INFORMATION IS AVAILABLE CONCERNING TO THE FREQUENCY AND EXTENT OF ANY FRACTURES WITHIN THIS UNIT. THERE ARE NO BEDROCK WELLS AT THE SITE.

GROUND WATER ELEVATIONS COLLECTED AT WELL PAIRS ON THE UPPER MACON SITE INDICATE THAT RECHARGE FROM THE SAPROLITE UNIT TO THE TRANSITION ZONE IS OCCURRING. APPROXIMATE DOWNWARD VERTICAL GRADIENTS WERE FROM 0.006 TO 0.14 FT/FT. VERTICAL HYDRAULIC CONDUCTIVITIES OBTAINED FROM SHELBY TUBE SAMPLES RANGED FROM 0.00853 TO 0.262 FT/DAY, WITH A GEOMETRIC AVERAGE OF 0.04 FT/DAY. USING THIS AVERAGE VALUE, VERTICAL GROUNDWATER FLOW VELOCITIES WERE ESTIMATED TO BE FROM 0.001 TO 0.028 FT/DAY.

ONLY ONE WELL PAIR IS LOCATED AT THE UPPER DOCKERY SITE. A VERTICAL UPWARD HYDRAULIC GRADIENT OF 0.05 FT/FT WAS MEASURED AT THIS WELL PAIR. USING THE AVERAGE VERTICAL HYDRAULIC CONDUCTIVITY OF 0.04 FT/DAY AT THE MACON SITE, THE VERTICAL GROUND WATER VELOCITY FOR THE UPPER DOCKERY SITE IS 0.01 FT/DAY. THIS UPWARD HYDRAULIC GRADIENT SUGGESTS THAT DISCHARGE TO THE SHALLOW UNIT IS OCCURRING AT THE UPPER DOCKERY SITE. SEASONAL VARIATIONS IN GROUND WATER ELEVATIONS MAY INFLUENCE THE DIRECTION OF THE VERTICAL GROUNDWATER FLOW.

G. METEOROLOGY

CLIMATE IN THE STUDY SITE AREA IS MODERATE, CHARACTERIZED BY COOL WINTERS AND HOT SUMMERS. AVERAGE MINIMUM TEMPERATURES ARE JUST BELOW FREEZING DURING THE WINTER MONTHS WITH AN AVERAGE HIGH TEMPERATURE OF 54 TO 57 DEGREE FAHRENHEIT. HIGH TEMPERATURES FOR THE SUMMER MONTHS AVERAGE NEAR 90 DEGREE FAHRENHEIT WITH AVERAGE MINIMUM TEMPERATURES AROUND 66 DEGREE FAHRENHEIT. ANNUAL AVERAGE PRECIPITATION IS 48 INCHES.

THE PREVAILING WIND DIRECTIONS FOR THE AREA ARE SOUTH OR SOUTHWEST FOR MOST OF THE YEAR. FOR THREE MONTHS OUT OF THE YEAR THE PREVAILING DIRECTION IS NORTHEAST. DESTRUCTIVE WINDS DO NOT OCCUR FREQUENTLY, BUT MAY OCCUR IN THE FORM OF TORNADOES OR HURRICANES WHICH STRIKE THE COAST.

H. DEMOGRAPHY AND LAND USE

CURRENT LAND USE WITHIN A ONE MILE RADIUS OF THE SITES IS PRIMARILY AGRICULTURAL WITH LIMITED RESIDENTIAL USE ALONG OLD CHERAW ROAD (SR 1103). RESIDENTIAL USE INCREASES NORTHEAST OF THE SITE AS ONE APPROACHES THE COMMUNITY OF CORDOVA 1.5 MILES AWAY. MUCH OF THE LAND SURROUNDING THE SITE IS UNINHABITED AND UNDEVELOPED. HOWEVER, FOUR RESIDENCES ARE WITHIN APPROXIMATELY 100 YARDS OF THE SITE. HUNTING IS THE PRIMARY HUMAN ACTIVITY AT THE SITE.

RICHMOND COUNTY IN GENERAL IS NOT A HEAVILY POPULATED AREA. THE TOTAL COUNTY POPULATION IS 46,853 BASED ON THE 1989 CENSUS. WITH A TOTAL AREA OF 447 SQUARE MILES, THE POPULATION DENSITY IS ONLY 105 PERSONS PER SQUARE MILE. NO SPECIFIC INFORMATION IS AVAILABLE FOR THE AREA SURROUNDING THE SITE; HOWEVER, IT IS ESTIMATED THAT THE DENSITY WITHIN A ONE MILE RADIUS IS ON THE ORDER OF 10 PERSONS PER SQUARE MILE.

I. UTILITIES

ELECTRICITY, CITY WATER, AND TELEPHONE CONNECTIONS ARE PRESENT ALONG SR 1103. MUNICIPAL SEWER AND NATURAL GAS SERVICES ARE NOT AVAILABLE.

#SHEA
SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. SITE HISTORY AND PREVIOUS INVESTIGATIONS

THE CHARLES MACON LAND WAS OBTAINED BY CHARLES AND DOROTHY MACON AS FIVE SEPARATE TRACTS FROM VARIOUS INDIVIDUALS. ONE TRACT WAS PURCHASED BY THE MACONS IN 1965; MRS. MACON PURCHASED THE OTHER FOUR IN NOVEMBER 1972.

THERE IS NO OFFICIAL RECORD OF LAND USE ON THE MACON PROPERTY BEFORE MAY 1979. THERE ARE SOME INDICATIONS AND VERBAL REPORTS THAT IT WAS USED TO DISPOSE OF UNSPECIFIED MANUFACTURING WASTES AND OILS, MANY OF WHICH WERE GENERATED FROM THE VARIOUS BUSINESS ENTERPRISES IN WHICH MR. MACON ENGAGED. THE EARLIEST DOCUMENTED EVIDENCE OF WASTE DISPOSAL DATES FROM MAY 1, 1979, AT WHICH TIME MR. MACON FORMED AND INCORPORATED TWO WASTE DISPOSAL-RELATED CORPORATIONS. THESE CORPORATIONS CONDUCTED A WASTE OIL RECYCLING BUSINESS UNDER THE NAME OF MACON FARMS TRUCKING, INC. AND MACON MACHINE COMPANY, INC.

FROM MAY 1979 THROUGH MAY 1981, MR. MACON OPERATED THE SITE AS A WASTE OIL RECYCLING PLANT, WITH MACON FARMS TRUCKING TRANSPORTING THE WASTE TO THE SITE AND MACON MACHINE COMPANY TREATING THE WASTE. HOWEVER, ON JUNE 27, 1980, MR. MACON SOLD HIS ENTIRE INTEREST IN MACON FARMS TRUCKING, INC., INCLUDING THE CAPITAL STOCK, TO SEVERAL INDIVIDUALS WHO SUBSEQUENTLY MOVED THE COMPANY TO SOUTH CAROLINA. IN MAY 1981, MR. MACON LEASED THE MACON MACHINE FACILITY AND FIVE ACRES OF LAND TO C&M OIL DISTRIBUTORS WHICH OPERATED THE RECYCLING PLANT UNTIL MARCH 1982.

ON JUNE 5, 1979, MR. MACON NOTIFIED THE NORTH CAROLINA DEPARTMENT OF NATURAL AND ECONOMIC RESOURCES, DIVISION OF ENVIRONMENTAL MANAGEMENT(DEM) THAT MACON MACHINE COMPANY WAS INSTALLING A LARGE BOILER TO REMOVE WASTE FROM WASTE OIL. THE PROCESS USED INVOLVED HEATING LARGE AMOUNTS OF WASTE OIL, WHICH WAS THEN SKIMMED. WASTE OIL CONVERTED BY THIS PROCESS WAS OBTAINED FROM VARIOUS GENERATORS AND STORED IN SURFACE IMPOUNDMENTS AT THE SITE. THIS TYPE OF OIL RECLAMATION PROCESS EMITS SULFUR DIOXIDE (SO2) DURING THE HEATING PROCESS. ON DECEMBER 4, 1979, MR. MACON APPLIED FOR A PERMIT TO CONSTRUCT AND OPERATE AN AIR POLLUTION ABATEMENT FACILITY TO CONTROL SO2 EMISSIONS. DEM GRANTED THE PERMIT FOR CONSTRUCTION AND OPERATION OF AN AIR POLLUTION ABATEMENT DEVICE FOR THE BOILER FIRING CHAMBER ON FEBRUARY 13, 1980.

DEN REQUESTED THAT THE NORTH CAROLINA DEPARTMENT OF HUMAN RESOURCES, SOLID AND HAZARDOUS WASTE MANAGEMENT BRANCH (DHR) CONDUCT AN INVESTIGATION OF THE MACON OPERATION BECAUSE THE FACILITY DID NOT HAVE A PERMIT TO RECYCLE WASTE OIL. ON OCTOBER 22, 1980, A SITE INSPECTION BY DHR CONFIRMED THAT MR. MACON WAS HANDLING HAZARDOUS SUBSTANCES. INSPECTORS OBSERVED THAT WASTE OIL WAS STORED IN 12 UNLINED AND PARTIALLY LINED SURFACE IMPOUNDMENTS OR LAGOONS. THE LAGOONS WERE OVERFLOWING AND CONTAMINATING THE SURROUNDING GROUND. INSPECTORS ALSO DISCOVERED 175 55-GALLON DRUMS IN VARIOUS STAGES OF DETERIORATION, MANY OF THEM BROKEN OR LEAKING. THE DRUMS CONTAINED WASTE SUCH AS METHANOL, TOLUENE, VINYL THINNERS, EPOXY, ENAMELS, LACQUERS, ETHYL ACETATE, CAUSTIC SODA, AND METHYLENE CHLORIDE. OIL AND SLUDGE IN THE LAGOONS CONTAINED LEAD, CHROMIUM, AND BARIUM AT LEVELS CONSIDERED HAZARDOUS UNDER THE FEDERAL RESOURCE CONSERVATION AND RECOVERY ACT (RCRA). DHR NOTIFIED MR. MACON ON NOVEMBER 10, 1980, THAT HE WAS HANDLING HAZARDOUS WASTE OIL AS A GENERATOR, STORAGE FACILITY OPERATOR, AND TRANSPORTER, AND INSTRUCTED HIM TO NOTIFY THE US

ENVIRONMENTAL PROTECTION AGENCY (EPA) AS REQUIRED BY LAW.

IN MAY 1981, DHR CONDUCTED A ROUTINE INSPECTION OF RECORDS KEPT BY A LOCAL MANUFACTURING COMPANY. DURING THE INSPECTION DHR DISCOVERED THAT THE MACON MACHINE COMPANY WAS THE RECIPIENT OF 12 55-GALLON DRUMS OF SODIUM HYDROXIDE LIQUID WASTE. DHR REINSPECTED THE MACON SITE TO LOCATE THE SODIUM HYDROXIDE CONTAINERS AND DISCOVERED THAT CONDITIONS REMAINED UNCHANGED FROM THOSE FOUND DURING THE OCTOBER 22, 1980, INSPECTION. AN INSPECTION OF MANIFESTS AND RANDOM SAMPLING OF MATERIAL AT THE SITE REVEALED THAT SODIUM HYDROXIDE, A RCRA LISTED WASTE, HAD BEEN TRANSPORTED TO THE SITE. SAMPLES COLLECTED ALSO EXHIBITED THE CHARACTERISTIC OF CORROSIVITY (PH 13.7). SAMPLES OF WASTE OIL ANALYZED EXCEEDED E.P. TOXICITY LIMITS FOR CHROMIUM, BARIUM AND LEAD. ONE WEEK LATER, ON MAY 26, 1981, DHR RECOMMENDED THAT EPA CONDUCT ITS OWN INVESTIGATION AND EVALUATION OF THE MACON SITE.

EPA RESPONDED BY CONDUCTING A RCRA COMPLIANCE INSPECTION ON JULY 16, 1981. TEN VIOLATIONS OF RCRA REGULATIONS WERE CITED AT THAT TIME INCLUDING: PERMIT VIOLATION; FAILURE TO MAINTAIN A WRITTEN INSPECTION SCHEDULE, CONTINGENCY PLAN, OR WASTE ANALYSIS PLAN; AND FAILURE TO TRAIN STAFF, PROVIDE SAFETY EQUIPMENT, OR ARRANGE EMERGENCY RESPONSE WITH LOCAL AUTHORITIES. A SUBSEQUENT REVIEW OF RCRA FILES INDICATED THAT THE COMPANY HAD FAILED TO SUBMIT AN APPLICATION FOR INTERIM STATUS UNDER SUBPART A. OF RCRA, AS REQUIRED, AND THEREFORE WAS CLASSIFIED AS A NON-NOTIFIER.

ON MARCH 26, 1982, AFTER MR. MACON'S DEATH, DHR SUED THE CHARLES MACON ESTATE, DOROTHY MACON, AND C&M OIL DISTRIBUTORS TO INITIATE CLEANUP ACTIVITIES ON THE MACON SITE. THE RELIEF WAS GRANTED BASED ON THE ACTUAL OR THREATENED RELEASE OF HAZARDOUS SUBSTANCES FROM THE SITE AND THE DEFENDANTS WERE ORDERED TO REMOVE ALL WASTE FROM THE SITE. IN COMPLIANCE WITH THE COURT ORDER, MR. DONALD DAWKINS, THE EXECUTOR OF THE MACON ESTATE AUCTIONED ITS ASSETS, AND USED THE PROCEEDS TO INITIATE CLEANUP ACTIVITY AT THE SITE IN NOVEMBER 1982. MR. DAWKINS HIRED AN ENGINEERING FIRM TO FIELD SCREEN, LABEL, SAMPLE, REMOVE DRUMS, AND INSTALL TWO GROUNDWATER MONITORING WELLS. HAZARDOUS MATERIALS WERE FOUND STORED AT THE MACON PORTION OF THE SITE IN MORE THAN 2,100 55-GALLON DRUMS, APPROXIMATELY 10 BULK TANKS, AND 11 SURFACE IMPOUNDMENTS. A TOTAL OF 300 55-GALLON DRUMS AND THE CONTENTS OF ONE LAGOON WERE REMOVED, AND TWO ON-SITE MONITORING WELLS WERE INSTALLED DOWNGRADIENT FROM THE LAGOON AREA BEFORE THE MACON ESTATE WERE EXHAUSTED. WITH NO OTHER RESOURCES AVAILABLE, DHR REQUESTED EPA'S ASSISTANCE TO COMPLETE THE CLEANUP OPERATIONS.

EPA INITIATED A REMOVAL AT THE MACON SITE ON NOVEMBER 11, 1983. DURING THE REMOVAL, A TOTAL OF 3,123 TONS OF WASTE AND 137,000 GALLONS OF OIL WAS REMOVED FROM THE SITE. EPA PUMPED WATER FROM 10 OF THE LAGOONS AND DISPERSED IT ON LAND IN ACCORDANCE WITH PROCEDURES OUTLINED BY DHR AND DEN. REUSABLE OIL WAS PUMPED FROM THE LAGOONS AND TAKEN TO AN OIL RECLAIMING FACILITY. OIL AND HYDROCARBON SLUDGES REMAINING IN THE LAGOONS WERE SOLIDIFIED, REMOVED, AND DISPOSED OF IN A RCRA-PERMITTED HAZARDOUS WASTE FACILITY IN SOUTH CAROLINA. THE LAGOONS WERE THEN FILLED, GRADED, AND SEEDED FOR GRASS.

REMOVAL OPERATIONS ON THE DOCKERY PROPERTY BEGAN ON JANUARY 9, 1984. HAZARDOUS MATERIALS AT THIS PORTION OF THE SITE WERE STORED IN ONE UNLINED SURFACE IMPOUNDMENT AND IN APPROXIMATELY 230 55-GALLON DRUMS. A TOTAL OF 709 TONS OF WASTE WAS REMOVED FROM THE SITE IN SIMILAR OPERATION TO THOSE CONDUCTED ON THE MACON PROPERTY.

ALL LAGOONS ON THE MACON AND DOCKERY PROPERTY WERE EXCAVATED AND BACK FILLED WITH SOIL EXCEPT LAGOON 10 WHICH IS REPORTED TO CONTAIN AN ESTIMATED 940 TONS OF CREOSOTE WASTE. DUE TO THE VOLUME OF SOLIDIFICATION MATERIALS REQUIRED FOR THIS LAGOON, IT WAS DECIDED BY THE ON SCENE COORDINATOR THAT THE LAGOON WOULD BE BACK FILLED AND CAPPED WITH A SYNTHETIC LINER AND A 3-FOOT CLAY CAP. PRIOR TO CAPPING, LAGOON 10 RECEIVED FIVE TRUCKLOADS OF SOLIDIFIED SLUDGE FROM LAGOON 7, TWO TRUCKLOADS OF BOILER FLY ASH, 43 CRUSHED EMPTY DRUMS AND AN UNKNOWN QUANTITY OF CONTAMINATED SOIL FROM THE DRUM STAGING AREA.

METHANOL-BASED ANTIFREEZE STORED IN 3,000 1-GALLON CONTAINERS WAS TRANSFERRED INTO 55-GALLON DRUMS AND SOLIDIFIED ON THE SITE. MATERIAL IN THE REMAINING DRUMS WAS SOLIDIFIED AND DELIVERED TO SOUTH CAROLINA FOR DISPOSAL AT A PERMITTED RCRA FACILITY, AND A LOCAL SCRAP METAL COMPANY REMOVED EMPTY DRUMS FROM THE SITE. IN ADDITION, 246 CALCIUM HYDROXIDE FLARE CHARGES WERE REMOVED BY THE EXPLOSIVE ORDINANCE DISPOSAL UNIT OF THE US ARMY.

IMMEDIATE REMOVAL ACTIVITIES FOR BOTH THE MACON AND DOCKERY PROPERTIES WERE COMPLETED ON JANUARY

17, 1984.

IN FEBRUARY 1985, NUS CORPORATION BEGAN A GEOLOGICAL AND SAMPLING INVESTIGATION OF THE SITE (NUS, 1985). THE OBJECTIVE OF THE INVESTIGATION WAS TO OBTAIN HYDROGEOLOGICAL DATA AND COLLECT SAMPLES OF SOIL, GROUND WATER, SURFACE WATER, AND STREAM SEDIMENTS. THE DATA OBTAINED DURING THIS INVESTIGATION WAS USED TO DETERMINE SITE CONDITIONS FOLLOWING THE INITIAL CLEAN-UP AND TO PROVIDE DATA NEEDED TO APPLY THE HAZARD RANKING SYSTEM (HRS) TO THE SITE. UNDER THIS INVESTIGATION, NUS INSTALLED ONE UPGRADIENT WELL (MW-01) AND THREE DOWNGRADIENT WELLS (MW-02, MW-03, MW-04) AT THE MACON SITE. THE UPGRADIENT WELL WAS INSTALLED ACROSS SR 1103 FROM THE MACON SITE AND THE THREE REMAINING WELLS WERE INSTALLED IMMEDIATELY DOWNGRADIENT OF LAGOONS 2, 6, AND 10. GROUNDWATER SAMPLES COLLECTED FROM THE FOUR WELLS WERE ANALYZED FOR PURGEABLE AND EXTRACTABLE ORGANICS AND INORGANIC CONSTITUENTS. GROUNDWATER SAMPLES WERE ALSO COLLECTED FROM WELL MW-05, WHICH WAS INSTALLED DURING THE INITIAL SITE CLEAN-UP AND ANALYZED FOR INORGANICS. A SUMMARY OF ANALYTICAL RESULTS ARE INCLUDED IN TABLE 1. SURFACE WATER AND SEDIMENT SAMPLES WERE ALSO COLLECTED AT THE SITE DURING THE NUS INVESTIGATION. THESE SAMPLES WERE ANALYZED FOR PURGEABLE AND EXTRACTABLE ORGANICS AND INORGANICS. RESULTS OF THESE ANALYSES ARE INCLUDED IN TABLE 2 AND TABLE 3.

THE MACON/DOCKERY SITE SCORED 47.10 OUT OF A TOTAL OF 100 ON THE HAZARD RANKING SYSTEM (HRS). THIS SITE WAS PROPOSED FOR ADDITION TO THE SUPERFUND NATIONAL PRIORITY LIST (NPL) IN JANUARY 1987 BECAUSE OF ACTUAL AND THREATENED RELEASES OF HAZARDOUS SUBSTANCES. THE SITE WAS PLACED ON THE NPL IN JULY 1987 MAKING IT ELIGIBLE TO RECEIVE FEDERAL FUNDING FOR LONG-TERM ACTION.

B. ENFORCEMENT ACTIVITIES

IN 1980, THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL HEALTH AND NATURAL RESOURCES (DHR) DETERMINED THAT MACON WAS HANDLING HAZARDOUS WASTE OIL AS A GENERATOR, STORAGE FACILITY OPERATOR, AND TRANSPORTER. IN 1981, DHR RECOMMENDED THAT EPA CONDUCT ITS OWN INVESTIGATION AND EVALUATION OF THE SITE. IN 1982 THE ESTATE OF THE THEN DECEASED MACON WAS ORDERED TO INITIATE CLEANUP ACTIVITY ON THE MACON PORTION OF THE SITE. WHEN THE ESTATE'S RESOURCES WERE EXHAUSTED, DHR REQUESTED ASSISTANCE FROM EPA. IN 1983 EPA ISSUED IMMEDIATE-REMOVAL NOTICE LETTERS TO THE FOLLOWING COMPANIES AND INDIVIDUALS:

1. JOHN DOCKERY
2. CROWN CORK AND SEAL, INC.
3. ACME NAMEPLATE & MANUFACTURING, INC.
4. AQUAIR CORPORATION
5. VAN STRAATEN CHEMICAL CO.
6. INMONT CORPORATION
7. E. I. DUPONT DE NEMOURS & CO., INC.
8. EXXON
9. THE LILLY COMPANY
10. ANDERSON OIL AND CHEMICAL CO., INC.
11. FREDERICK GUMM CHEMICAL CO., INC.
12. ASHLAND CHEMICAL CO.
13. ETHYL CORPORATION
14. DOROTHY MACON

ALL OF THE POTENTIALLY RESPONSIBLE PARTIES (PRPS), DECLINED TO PARTICIPATE IN THE REMOVAL. IN 1983, EPA INITIATED A REMOVAL AT THE MACON SITE UNDER THE AUTHORITY OF SECTION 104 OF CERCLA. REMOVAL OPERATIONS ON THE DOCKERY PROPERTY BEGAN IN 1984. REMOVAL ACTIONS AT BOTH SITES WERE COMPLETED IN 1984. THE COST OF THE REMOVAL ACTION WAS APPROXIMATELY $577,618 FOR THE MACON SITE AND $118,438 FOR THE DOCKERY SITE.

AFTER A 1985 TECHLAW RESPONSIBLE PARTY SEARCH, EPA SENT DEMAND LETTERS TO THE ABOVE NAMED INDIVIDUALS AND OTHER IDENTIFIED PRPS REQUESTING REIMBURSEMENT FOR THE REMOVAL COST. AFTER THESE COST REMAINED UNPAID A COST RECOVERY ACTION WAS FILED ON JULY 23, 1986 IN THE UNITED STATES DISTRICT COURT FOR THE MIDDLE DISTRICT OF NORTH CAROLINA. THE COMPLAINT NAMED THE FOLLOWING PRIMARY DEFENDANTS:

1. DOROTHY MACON
2. NICHOLAS DOCKERY
3. SAIRFAX DOCKERY
4. JOHN C. DOCKERY
5. C&M OIL DISTRIBUTOR INC.
6. CROWN CORK AND SEAL CO. INC.
7. ACME NAMEPLATE & MFG., INC.
8. CAROLINA ALUMINUM PRODUCTS DISTRIBUTING CO.
9. CLARK EQUIPMENT CO.

IN THE COMPLAINT, MACON AND THE DOCKERY'S WERE NAMED AS OWNERS, C&M OIL DISTRIBUTORS WAS NAMED AS AN OPERATOR, AND THE REMAINING DEFENDANTS WERE NAMED AS GENERATORS.

DURING THE COURSE OF THE LITIGATION, THIRD-PARTY CLAIMS WERE FILED BY FIVE OF THE PRIMARY DEFENDANTS AGAINST CERTAIN GENERATORS AND TRANSPORTERS.

1. JAMES WASTE OIL (JAMES)
2. PRIDE-TRIMBLE CORPORATION (PRIDE)
3. UNION CARBIDE CORPORATION (UNION)
4. CAROLINA POWER AND LIGHT CO. (CPL)
5. B.W. MITCHUM TRUCKING (TRUCKING)

IN 1987, EPA SENT NOTICE LETTERS TO THE PRPS REQUESTING THAT THEY CONDUCT A REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) FOR THE SITE. THE NOTICE LETTERS ALSO INFORMED THE PRPS OF THEIR POTENTIAL LIABILITY FOR PAST COSTS. ON APRIL 14, 1988, EPA ENTERED INTO AN ADMINISTRATIVE ORDER ON CONSENT WHEREIN TWO OF THE PRPS, CLARK EQUIPMENT COMPANY AND CROWN CORK AND SEAL COMPANY, AGREED TO PERFORM THE RI/FS.

IN 1989, THE 1986 COST RECOVERY LITIGATION WAS SETTLED VIA A CONSENT DECREE FOR PAST COSTS INVOLVING ALL TEN PRIMARY DEFENDANTS AND SEVERAL THIRD PARTY DEFENDANTS. THE PRIMARY DEFENDANTS, EXCEPT FOR THE DOCKERY'S, AND CERTAIN THIRD-PARTY DEFENDANTS (PRIDE, UNION, JAMES, MITCHUM, AND CPL) JOINTLY AGREED TO REIMBURSE THE UNITED STATES FOR THE MAJORITY OF PAST COSTS. IN EXCHANGE FOR ACCESS TO THE DOCKERY PROPERTY, THE UNITED STATES AGREED TO DISMISS ITS CASE FOR PAST COSTS AGAINST THE DOCKERY'S.

THE TOTAL COSTS FOR THE SITE AS OF SEPTEMBER 30, 1990 ARE $1,853,577.30. EPA COLLECTED ONE HUNDRED PERCENT OF PAST COSTS, FOR THE REMOVAL ($1,853,100) FROM THE SETTLING DEFENDANTS. IN JANUARY 1991, EPA SENT A DEMAND LETTER AND SUPPORTING DOCUMENTATION TO CLARK EQUIPMENT AND CROWN CORK AND SEAL, (THE DEFENDANTS WHO AGREED TO UNDERTAKE THE RE/FS) FOR THE 1989 COSTS. SINCE EPA DID NOT CONDUCT THE RI/FS AT THE SITE, EPA'S COSTS BASICALLY INVOLVED OVERSIGHT COSTS. THE 1989 COSTS TOTALING $128,080.11 WERE PAID BY THE ABOVE NAMED DEFENDANTS. THE 1990 COSTS TOTAL $140,379.19.

#HCP
3. HIGHLIGHTS OF COMMUNITY PARTICIPATION

PURSUANT TO CERCLA SS 113(K)(2)(B)(I-V) AND 117, THE RI/FS REPORT AND THE PROPOSED PLAN FOR THE MACON/DOCKERY SITS WERE RELEASED TO THE PUBLIC FOR COMMENT ON JULY 25, 1991. THESE TWO DOCUMENTS WERE MADE AVAILABLE TO THE PUBLIC IN THE ADMINISTRATIVE RECORD LOCATED IN AN INFORMATION REPOSITORY MAINTAINED AT THE EPA DOCKET ROOM IN REGION IV AND AT THE LEATH MEMORIAL LIBRARY IN ROCKINGHAM, NORTH CAROLINA. THE NOTICE OF AVAILABILITY FOR THESE DOCUMENTS WAS PUBLISHED IN THE RICHMOND COUNTY JOURNAL ON JULY 25, 1991. A PUBLIC COMMENT PERIOD ON THE DOCUMENTS WAS HOLD FROM JULY 25, 1991, TO AUGUST 23, 1991. IN ADDITION A PUBLIC MEETING WAS HOLD ON AUGUST 6, 1991. AT THIS MEETING, REPRESENTATIVES FROM EPA ANSWERED QUESTIONS ABOUT PROBLEMS AT THE SITE AND THE REMEDIAL ALTERNATIVES UNDER CONSIDERATION.

THE PUBLIC COMMENT PERIOD WAS EXTENDED AN ADDITIONAL 30 DAYS IN RESPONSE TO A REQUEST FOR AN EXTENSION DATED AUGUST 19, 1991 RECEIVED FROM THE PRPS. THIS EXTENSION IN ACCORDANCE WITH THE NATIONAL CONTINGENCY PLAN, CFR S 300.430(F)(3)(I)(C). AS A RESULT OF THIS EXTENSION, THE PUBLIC COMMENT PERIOD ENDED ON SEPTEMBER 23, 1991. THE PUBLIC WAS INFORMED OF THIS EXTENSION THROUGH A PUBLIC NOTICE IN A LOCAL NEWSPAPER AND BY MEANS OF A SHORT FACT SHEET. A RESPONSE TO THE COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD IS INCLUDED IN THE RESPONSIVENESS SUMMARY, WHICHIS PART OF THIS RECORD OF DECISION (ROD).

#SAR
4. SCOPE AND ROLE OF RESPONSE ACTION WITHIN SITE STRATEGY

THE INTENT OF THIS REMEDIAL ACTION PRESENTED IN THIS ROD IS TO REDUCE FUTURE RISKS AT THIS SITE. THIS REMEDIAL ACTION WILL REMOVE THE THREAT POSED BY CONTAMINATED GROUNDWATER, REMEDIATE RESIDUAL AND SOURCE SOIL CONTAMINATION, AND REMOVE THE THREAT POSED BY VESSEL CONTENTS AT THE SITE. REMEDIATING RESIDUAL AND SOURCE SOIL CONTAMINATION WILL PREVENT CONTAMINATION FROM ADVERSELY IMPACTING GROUNDWATER AND DECREASE THE FUTURE RISK ASSOCIATED WITH SITE SOILS. THIS IS THE ONLY ROD CONTEMPLATED FOR THE SITE. NO OTHER OPERABLE UNITS HAVE BEEN IDENTIFIED AT THIS SITE.

#SSC
5. SUMMARY OF SITE CHARACTERISTICS

THE RI AT THE MACON/DOCKERY SITE FOUND THAT NO UNIFORM VERTICAL OR HORIZONTAL DISTRIBUTION OF THE RESIDUAL CHEMICALS IS APPARENT. INSTEAD, CHEMICAL RESIDUALS IN SOIL AND GROUND WATER APPEAR TO BE CONCENTRATED IN LOCALIZED AREAS RELATED TO FORMER STORAGE ACTIVITIES (LAGOON WASTE AND DRUM STORAGE).

PCBS AND PESTICIDES ARE NOT CHEMICALS OF CONCERN AT THE SITE. CHEMICALS OF INTEREST INCLUDE SELECTED VOLATILE AND SEMI-VOLATILES ORGANIC COMPOUNDS AND INORGANIC COMPOUNDS. A SUMMARY OF MATRICES AND CONTAMINANTS FOR THE MACON/DOCKERY SITE IS PRESENTED IN TABLE 4.

PREVIOUS REMOVAL ACTIONS BY THE US EPA HAVE SIGNIFICANTLY REDUCED OR ELIMINATED THE CONCENTRATIONS OF CONTAMINANTS IN POTENTIAL SOURCE AREAS (SOILS) AND THEREFORE HAVE REDUCED ANY IMPACT TO RECEPTOR AREAS (E.G., SURFACE WATER, SEDIMENT, GROUND WATER).

A. SURFACE SOILS

MACON SITE

ANALYTICAL DATA FOR SURFACE SOILS COLLECTED FROM THE MACON SITE INDICATE THAT RESIDUAL CHEMICALS CORRELATE WELL WITH EITHER (A) ISOLATED OCCURRENCES OF DISPOSED MATERIAL AND CHEMICALS OR (B) WASTE MATERIALS ASSOCIATED WITH KNOWN DISPOSAL AREAS (LAGOONS) AS OPPOSED TO WIDESPREAD AREAS OF SURFACE AND SHALLOW SUBSURFACE DISPOSAL. CHEMICAL ANALYSES OF 30 SURFACE SOIL SAMPLES DETECTED THE PRESENCE OF 35 TARGET COMPOUND LIST (TCL; ORGANICS) COMPOUNDS AT THE UPPER ADD LOWER MACON SITE (TABLES 5 AND 6). THESE CONSTITUENTS INCLUDED 3 ACID EXTRACTABLE COMPOUNDS (SEMI-VOLATILES) 22 BASE/NEUTRAL EXTRACTABLE COMPOUNDS (ALSO SEMI-VOLATILES), ONE PESTICIDE, AND 9 VOLATILE ORGANIC COMPOUNDS (VOLATILES). THE MAJORITY OF COMPOUNDS DETECTED IN SURFACE SOILS WERE POLY AROMATIC HYDROCARBONS (PAHS) A SUBSET OF THE BASE/NEUTRAL EXTRACTABLE COMPOUNDS.

ONLY A SINGLE PESTICIDE WAS DETECTED AT THE SITE. DIELDRIN (A PESTICIDE) WAS REPORTED AT 22 UG/KG IN ONLY ONE SAMPLE. THIS SAMPLE IS BELIEVED TO REPRESENT CONTAMINATION TRANSPORT OF DIELDRIN FROM AN ADJACENT RESIDENCE (ABOUT 400 FEET UPWIND) AND NOT FROM THE SITE.

THE DETECT TARGET ANALYTE LIST (TAL; INORGANICS) CONSTITUENTS AT THE MACON SITE (UPPER; TABLE 7, LOWER; TABLE 8) GENERALLY OCCUR IN CONCENTRATIONS LESS THAN THOSE REPORTED FOR TYPICAL BACKGROUND INORGANICS DATA FOR SURFACE SOILS TYPICAL OF THE AREA.

DOCKERY SITE

DETECTED TCL CONSTITUENTS AMONG THE DOCKERY SITE SURFACE SOIL SAMPLES INCLUDED DI-N-BUTYL PHTHALATE, ACETONE, AND METHYLENE CHLORIDE. HOWEVER, THESE SAMPLE CONCENTRATIONS SEEM TO INDICATE LABORATORY CONTAMINATION. CONSEQUENTLY, ANALYTICAL DATA FOR SURFACE SOILS COLLECTED FROM THE DOCKERY SITE DO NOT INDICATE THE PRESENCE OF TCL CHEMICALS.

THE DETECTED TAL CONSTITUENTS AT THE DOCKERY SITE SURFACE SOIL (TABLES 9 AND 10) GENERALLY OCCUR AT BACKGROUND CONCENTRATIONS (TABLE 11). NO TAL CONSTITUENTS WERE DETECTED AT SIGNIFICANT CONCENTRATIONS IN THE DOCKERY SITE SURFACE SOIL SAMPLES.

B. VADOSE ZONE SOILS

TEST PITS AND SOIL BORINGS (INCLUDING BORINGS ADVANCED FOR MONITORING WELL INSTALLATION) WERE

EMPLOYED TO DIRECTLY OBSERVE AND SAMPLE WASTE MATERIALS AND IMPACTED VADOSE ZONE SOILS IN SUSPECT AREAS.

TEST PITS WERE EXCAVATED AT FORMER LAGOONS AT THE SITE AND WERE GENERALLY EXCAVATED TO A DEPTH OF 10 TO 13 FEET BELOW THE GROUND SURFACE. THIS WAS ALSO BELOW THE DEPTH OF VISUALLY DETERMINED CHANGES IN SOIL STRATA CAUSED BY PREVIOUS SITE ACTIVITIES. ORGANIC ANALYTICAL DATA FOR THE MACON SITE TEST PIT SAMPLES (TABLES 12 AND 13) INDICATE THAT VOLATILES ARE THE PREDOMINANT TCL CONSTITUENTS IN VADOSE SOILS UNDERLYING THE FORMS WASTE LAGOONS. ORGANICS DATA (TABLE 15) FOR THE LOWER DOCKERY SITE TEST PIT (NO TEST PIT AT THE UPPER DOCKERY SITE)INDICATE LOW LEVELS OF PRIMARILY VOLATILE ORGANIC COMPOUNDS.

INORGANIC DATA (TAL PARAMETERS) FOR THE TEST PITS ARE PROVIDED IN TABLES 14 THROUGH 16.

SOIL BORINGS WERE ALSO DRILLED AT THE SITE. SOIL SAMPLES WERE COLLECTED FROM BORINGS GENERALLY AT 15-17 FEET AD 25-27 FEET BELOW THE LAND SURFACE. CONSEQUENTLY, SAMPLES FROM SOIL BORINGS ADVANCED THROUGH FORMER LAGOONS WERE COLLECTED BENEATH THE BOTTOM OF THE FORMER LAGOONS. SOIL BORINGS SAMPLES WERE ALSO COLLECTED AS PART OF THE MONITORING WELL INSTALLATIONS.

ANALYTICAL DATA FROM SOIL BORING VADOSE ZONE SAMPLES (TABLES 17 THROUGH 24) SUBSTANTIATE CONCLUSIONS DEVELOPED UPON REVIEW OF TEST PIT SAMPLES. ELEVATED CONCENTRATIONS, OF TCL CONSTITUENTS IN VADOSE ZONE SOILS ARE ASSOCIATED WITH FORMER WASTE STORAGE LAGOON AREAS. DETECTED TCL CONSTITUENTS GENERALLY CORRESPOND TO THE TYPES OF MATERIALS REPORTEDLY REMOVED BY THE US EPA CLEAN-UP IN THE FORMER LAGOON STORAGE AREAS.

DETECTED TAL CONSTITUENTS IN SOIL BORING SAMPLES CORRESPOND TO THOSE REPORTED FOR THE TEST PIT SOILS. TABLE 25 COMPARES MAXIMUM VADOSE ZONE INORGANIC CONCENTRATIONS WITH SITE CONTROL DATA. FOR EASE OF COMPARISON, VADOSE SOILS HAVE BEEN GROUPED INTO 6 AREAS BASED ON THE CLOSE PROXIMITY OF CERTAIN FORMER LAGOONS.

C. GROUND WATER

UPPER MACON SITE

ANALYTICAL DATA (TABLES 26 AND 27) INDICATE THAT THE GROUNDWATER IN THE VICINITY OF MONITORING WELLS MW-03 AND MW-11 (FIGURE 2) HAS NOT BEEN IMPACTED BY FORMER WASTE HANDLING ACTIVITIES AT THE UPPER MACON SITE. TCL CONSTITUENTS WERE UNDETECTED IN THESE WELL SAMPLES, AND DETECTED TAL CONSTITUENTS ARE CONSISTENT WITH THOSE REPORTED FOR THE CONTROL SAMPLE (MW-01). MONITORING WELL MW-01 CONTAINS TRACE CONCENTRATIONS OF TCL CONSTITUENTS. THE PRESENCE OF THESE TRACE COMPOUNDS IS LIKELY RELATED TO TRANSPORT OF RESIDUAL CHEMICALS IN GROUND WATER TOWARDS MW-01 DURING SEASONAL CHANGE'S IN GROUNDWATER FLOW.

GROUNDWATER SAMPLES COLLECTED FROM MONITORING WELLS MW-2, MW-2A, MW-5, MW-6, MW-8, MW-8A, MW-9, MW-10, AND MW-19 EXHIBIT VARYING CONCENTRATIONS OF TCL CONSTITUENTS. ONLY GROUNDWATER SAMPLES COLLECTED FROM WELLS MW-9 AND MW-19 CONTAINED BASE/NEUTRAL/ACID EXTRACTABLE COMPOUNDS AS WELL AS VOLATILE ORGANIC COMPOUNDS. THE REMAINING SAMPLES CONTAINED ONLY VOLATILE ORGANIC COMPOUNDS. EACH OF THE WELLS LISTED ABOVE ARE LOCATED DIRECTLY DOWN-GRADIENT FROM AREAS OF PAST WASTE STORAGE, PRIMARILY LAGOONS. THE PRESENCE OF RESIDUAL CHEMICALS IN THESE WELLS IS LIKELY DUE TO THE CLOSE PROXIMITY OF STORAGE LAGOON AREAS AND APPROPRIATE PLACEMENT OF THE WELLS FOR INTERCEPTING RESIDUAL CHEMICALS IN GROUND WATER MOVING AWAY FROM THE SOURCE AREAS.

IN GENERAL, GROUNDWATER SAMPLES WHICH CONTAINED TAL METALS AT CONCENTRATIONS ABOVE THOSE REPORTED FOR THE CONTROL SAMPLE (MW-01) WERE COLLECTED FROM MONITORING WELLS MW-5, MW-6, MW-7, MW-8, MW-8A, MW-9, MW-10, AND MW-19.

LOWER MACON SITE

ANALYTICAL DATA FOR LOWER MACON SITE MONITORING WELLS (TABLE 28) INDICATE THE PRESENCE OF RESIDUAL TCL CONSTITUENTS. AS WITH THE MAJORITY OF UPPER MACON SITE WELLS, THE PRESENCE OF RESIDUAL CHEMICALS IN WELLS MW-4, MW-12, MW-13, AND MW-14R (FIGURE 3) APPEAR TO BE RELATED TO THE PRESENCE AND CLOSE PROXIMITY OF FORMER WASTE STORAGE AREAS, PRIMARILY LAGOON. THESE WELLS ARE LOCATED DIRECTLY DOWNGRADIENT OF LAGOON AREAS AND SERVE AS DIRECT MONITORING POSITIONS FOR RESIDUAL CHEMICALS MIGRATING TO THE NORTHWEST IN GROUND WATER.

UPPER DOCKERY SITE

CONCENTRATION OF TCL CONSTITUENTS AT THE UPPER DOCKERY SITE (TABLE 29) WERE DETECTED IN AN AREA WHERE DRUMS HAD BEEN STORED. GROUNDWATER SAMPLES COLLECTED FROM MONITORING WELL MW-15 (FIGURE 3) INDICATED RESIDUAL CHEMICALS, ESPECIALLY 1,1,1-TRICHLOROETHANE, 1,1-DICHLOROETHANE, AND 1,1-DICHLOROETHENE. TABLE 30 SUMMARIZES DETECTED TAL CONSTITUENTS. REVIEW OF AERIAL PHOTOGRAPHS OF THE SITE AND VISUAL OBSERVATIONS DURING RI FIELD ACTIVITIES INDICATE THAT THE VICINITY OF MW-15 WAS USED FOR DRUM STORAGE. CONTAMINANT TRANSPORT MODELING INDICATES THAT THE GROUNDWATER CONTAMINANT PLUME MAY EXTEND SEVERAL HUNDRED FEET DOWNGRADIENT FROM THE VICINITY OF MW-15.

LOWER DOCKERY SITE

THE PRESENCE OF RESIDUAL CHEMICALS (TCL AND TAL CONSTITUENTS; TABLE 31)IN MW-16 (LOWER DOCKERY SITE) APPEARS TO BE RELATED TO THE CLOSE PROXIMITY OF THE WELL TO LAGOON 12. MW-16 IS LOCATED IMMEDIATELY DOWNGRADIENT OF LAGOON 12 AND SERVES AS A DIRECT MONITORING POSITION FOR GROUND WATER MIGRATING AWAY FROM MW-16 (FIGURE 3).

PRIVATE WELLS

NO TCL COMPOUNDS WERE FOUND IN SAMPLES COLLECTED FROM PRIVATELY-OWNED WELLS NEAR THE SITE (TABLE 32). DETECTED TAL CONSTITUENTS FOR WELLS PW-02 AND PW-03 WERE WITHIN MAXIMUM CONTAMINANT LEVELS (MCLS) AND RANGES DETERMINED FROM THE CONTROL SAMPLE. IN WELL PW-04, IRON EXCEEDED THE SECONDARY MCL (483 UG/L VERSUS AN MCL OF 300 UG/L) BUT WAS LESS THAN THE CONCENTRATION DETECTED IN THE CONTROL SAMPLE. WELL PW-05 EXCEEDED MCLS FOR IRON AND MANGANESE. HOWEVER, THESE CONSTITUENTS WERE DETECTED IN CONCENTRATIONS LESS THAN THE CONTROL SAMPLE.

VANADIUM AND ZINC WERE DETECTED IN CONCENTRATIONS SLIGHTLY EXCEEDING THE CONTROL SAMPLE (MW-01). CONSEQUENTLY, ELEVATED CONCENTRATIONS OF THESE TWO METALS ARE MOST LIKELY ATTRIBUTABLE TO NATURAL BACKGROUND LEVELS.

COBALT, COPPER, MAGNESIUM, VANADIUM, AND ZINC CONCENTRATIONS IN PW-05 EXCEEDED THE CONTROL SAMPLE (MW-01) CONCENTRATION. PW-05 IS LOCATED AT A SLAUGHTERHOUSE FACILITY THAT IS HYDRAULICALLY UPGRADIENT FROM THE SITE. OBSERVED SITE CONDITIONS AT THE SLAUGHTERHOUSE INDICATE THAT IMPACT TO THE SOIL AND GROUNDWATER MEDIA ARE POSSIBLY DUE TO THE SLAUGHTERING OPERATIONS, CLEANING PRACTICES, AND DISPOSAL PROCEDURES. IN SUMMARY, THE SITE DOES NOT ADVERSELY IMPACT PRIVATE WELLS.

D. SURFACE WATER

NO RESIDUAL TCL CONSTITUENTS WERE DETECTED IN SURFACE WATER SAMPLES COLLECTED DOWNGRADIENT FROM EITHER THE MACON SITE OR THE DOCKERY SITE (TABLE 33). TAL CONSTITUENTS (TABLE 33) DETECTED IN THE MACON SITE SURFACE WATER CONTROL SAMPLE (SW/SED-03; FIGURE 7) WERE WITHIN NORMAL RANGES FOR NATURAL WATERS.

THE SURFACE WATER SAMPLE COLLECTED FROM THE LOWER MACON SITE POND CONTAINED ELEVATED CONCENTRATIONS OF BARIUM, CALCIUM, MAGNESIUM, AND MANGANESE. THE SURFACE WATER RESULTS OF SAMPLES COLLECTED DOWN-GRADIENT OF THE DOCKERY SITE ARE ESSENTIALLY THE SAME AS THE RESULTS FROM THE CONTROL SAMPLE (SW/SED-07, FIGURE 7) FOR TAL CONSTITUENTS (TABLE 34). THE IMPACT OR RESIDUAL CHEMICALS FROM THE SITE TO SOLOMON'S CREEK IS MINIMAL.

E. SEDIMENT

TCL CONSTITUENTS DETECTED IN MACON SITE SEDIMENT SAMPLES (TABLE 35) CORRESPOND WITH TAR OR ASPHALT-COATED WOOD FRAGMENTS FROM THE BRIDGE MATERIALS (NOT RELATED TO THE SITE) THAT WERE FOUND IN THE SEDIMENT SAMPLE. TCL CONSTITUENTS WERE NOT DETECTED IN OTHER DOWNSTREAM SEDIMENT SAMPLES. SEDIMENT SAMPLES FROM THE DOCKERY SITE (TABLE 36) INDICATE THE PRESENCE OF BENZOIC ACID AND BENZO(A)PYRENE. HOWEVER, THE REMOTE NATURE OF THE SAMPLING LOCATION INDICATES THAT THESE COMPOUNDS ARE NOT FROM THE SITE.

POND SEDIMENT SAMPLES (LOWER MACON SITE) AND SURFACE WATER SAMPLES CONTAINED INORGANICS AT OR NEAR BACKGROUND CONCENTRATIONS. ANALYTICAL AND PHYSICAL DATA INDICATE THAT STREAM SEDIMENT TRANSPORT IS NOT ACTING AS A MECHANISM FOR THE OFF-SITE TRANSPORT OF TAL CONSTITUENTS.

F. VESSELS

SITE VESSELS (ABOVE GROUND TANKS, TANKERS, AND VATS) THAT CONTAINED MIXTURES OF WATER, OIL, TAR, AND SOLIDS WERE SAMPLED. SAMPLES WERE SUBMITTED FOR TOXICITY CHARACTERISTICS LEACHING PROCEDURE (TCLP) VOLATILES, SEMI-VOLATILES, AND INORGANICS ANALYSES. IN ADDITION, IGNITABILITY AND CORROSIVITY TESTS WERE CONDUCTED ON SAMPLES TO DETERMINE IF THEY MET THE CHARACTERISTIC OF A HAZARDOUS WASTE ACCORDING TO RCRA.

VESSEL ANALYTICAL DATA ARE SUMMARIZED IN TABLE 37. ALL SAMPLES ANALYZED WERE DETERMINED TO BE NONHAZARDOUS (RCRA) EXCEPT FOR LEAD (PB) IN TANK SAMPLES 3 AND 4 (BOTH OILS) AND VAT 4 (SOLIDS). TANK 3 EXCEEDED THE REGULATORY TCLP LEVEL FOR LEAD BY A FACTOR OF 3 (15 MG/L). TANK 3 AND VAT 4 LEVELS WERE LESS. ESTIMATED VOLUMES OF WATER, OIL, TAR, AND SOLIDS ARE PROVIDED IN TABLE 38.

#SSR
6. SUMMARY OF SITE RISKS

THE RISK ASSESSMENT REPORT CONSISTS OF THE FOLLOWING SECTIONS: CONTAMINANT IDENTIFICATION, EXPOSURE ASSESSMENT, TOXICITY ASSESSMENT, RISK CHARACTERIZATION, AND ENVIRONMENTAL (ECOLOGICAL) ASSESSMENT. THESE SECTIONS AS WRITTEN FOR THE MACON/DOCKERY REMEDIAL INVESTIGATION/FEASIBILITY STUDY ARE SUMMARIZED BELOW.

A. CONTAMINANTS OF CONCERN

FOR THE BASELINE RISK ASSESSMENT, EACH OF THE FOUR AREAS AT THE SITE WERE ASSESSED FOR CONTAMINATION IN SURFACE SOIL, GROUNDWATER, SURFACE WATER (IF PRESENT), AND SEDIMENT (IF PRESENT). CONSEQUENTLY, MEDIA OF CONCERN WERE IDENTIFIED FOR THE FOUR AREAS AT THE SITE AS FOLLOWS: UPPER DOCKERY - GROUNDWATER; LOWER DOCKERY - SURFACE SOIL (INCLUDING AIRBORNE PARTICULATES), GROUNDWATER, SURFACE WATER, SEDIMENTS; UPPER MACON - SURFACE SOIL (& AIRBORNE PARTICULATES), GROUNDWATER; LOWER MACON - SURFACE SOIL (& AIRBORNE PARTICULATES), SURFACE WATER, SEDIMENT. OTHER MEDIA DETERMINED TO BE OF CONCERN WERE DOWNGRADIENT SURFACE WATER (PEE DEE RIVER) THAT IS USED BY RESIDENTS OF CHERAW, SC, AS WELL AS FISH THAT MIGHT BE CAUGHT FROM THE RIVER.

FOR MEDIA WITH SAMPLE DATA, EXPOSURE POINT CONCENTRATIONS WERE DETERMINED BY CALCULATING A STATISTICAL UPPER CONFIDENCE LIMIT (UCL) VALUE. IF TOO FEW DATA WERE AVAILABLE TO CALCULATE A UCL VALUE, THE MAXIMUM DETECTED CONCENTRATION WAS USED AS THE EXPOSURE POINT CONCENTRATION. MODELING WAS USED TO DETERMINE CONCENTRATIONS IN FISH TISSUE, IN WATER WITHDRAWN FROM THE PEE DEE RIVER FOR THE CHERAW, SC WATER SYSTEM, AND OF CONTAMINATED SOIL PARTICULATES IN AIR. EXPOSURE POINT CONCENTRATIONS ARE LISTED BY MEDIUM FOR EACH OF THE SITE AREAS IN TABLE 39.

B. EXPOSURE ASSESSMENT

CURRENT POPULATIONS THAT MAY BE EXPOSED TO SITE-RELATED CHEMICALS INCLUDE RESIDENTS LIVING IN THE AREA SURROUNDING THE MACON/DOCKERY SITE, CHILD-AGED TRESPASSERS, HUNTERS AND FISHERMEN WHO MAY ENTER THE SITE, AND RESIDENTS OF CHERAW, SOUTH CAROLINA WHO CONSUME DRINKING WATER WITHDRAWN FROM THE PEE DEE RIVER DOWNSTREAM FROM THE SITE. SINCE THE LAND USE OF THE SURROUNDING AREA IS MOSTLY RURAL RESIDENTIAL, IT IS FEASIBLE THAT RESIDENTS COULD LIVE ON THE SITE IN THE FUTURE.

HUMAN EXPOSURE PATHWAYS HAVE BEEN IDENTIFIED FOR CURRENT AND POTENTIAL FUTURE AT THE SITE. THE CURRENT LAND USE SCENARIO ASSUMES AN INDIVIDUAL TRESPASSES ONTO THE SITE FOR RECREATIONAL PURPOSES. THE YOUNG CHILD (AGED 5-6) TRESPASSES ONTO THE SITE 48 DAYS/YEAR; THE OLDER CHILD (AGED 6-15) TRESPASSES 76 DAYS/YEAR; AND THE ADULT HUNTER SPENDS 114 DAYS/YEAR(LENGTH OF HUNTING SEASON) ON THE SITE. EXPOSURE OCCURS VIA INHALATION OF PARTICULATES (STIRRED UP BY ALL-TERRAIN-VEHICLE ACTIVITY) BY THE OLDER CHILD AND TO ALL AGE GROUPS VIA INCIDENTAL INGESTION OF AND DERMAL CONTACT WITH SURFACE SOIL, SURFACE WATER, AND SEDIMENTS. ONE-FOURTH OF THE FISH CONSUMED BY AN ADULT IS ASSUMED TO BE CAUGHT IN THE AREA. ESTIMATED CONTAMINANT CONCENTRATIONS IN FISH IN THE AREA NEAREST THE SITE THAT WOULD BE FISHED ARE LISTED IN TABLE 40.

THE FUTURE LAND USE SCENARIO ASSUMES RESIDENTIAL DEVELOPMENT ON THE SITE. EXPOSURE IS ASSUMED TO OCCUR TO AN ADULT AND TO A CHILD VIA ALL THE PATHWAYS LISTED IN THE CURRENT USE SCENARIO, BUT WITH DAILY EXPOSURE. ADDITIONALLY, THIS SCENARIO ASSUMES RESIDENTIAL USE OF ON SITE GROUNDWATER.

C. TOXICITY ASSESSMENT

UNDER CURRENT EPA GUIDELINES, THE LIKELIHOOD OF ADVERSE EFFECTS TO OCCUR IN HUMANS FROM CARCINOGENS AND NONCARCINOGENS ARE CONSIDERED SEPARATELY. THESE ARE DISCUSSED BELOW.

CARCINOGENS

EPA USES A WEIGHT-OF-EVIDENCE SYSTEM TO CLASSIFY A CHEMICAL'S POTENTIAL TO CAUSE CANCER IN HUMANS. ALL EVALUATED CHEMICALS FALL INTO ONE OF THE FOLLOWING CATEGORIES: CLASS A - KNOWN HUMAN CARCINOGEN; CLASS B - PROBABLE HUMAN CARCINOGEN - B1 MEANS THERE IS LIMITED HUMAN EPIDEMIOLOGICAL EVIDENCE, AND B2 MEANS THERE IS SUFFICIENT EVIDENCE IN ANIMALS AND INADEQUATE OR NO EVIDENCE IN HUMANS; CLASS C - POSSIBLE HUMAN CARCINOGEN; CLASS D - NOT CLASSIFIABLE AS TO HUMAN CARCINOGENICITY; AND CLASS E - EVIDENCE OF NONCARCINOGENICITY FOR HUMANS.

CANCER SLOPE FACTORS (SFS), INDICATIVE OF CARCINOGENIC POTENCY, ARE DEVELOPED BY EPA'S CARCINOGENIC ASSESSMENT GROUP TO ESTIMATE EXCESS LIFETIME CANCER RISKS ASSOCIATED WITH EXPOSURE TO POTENTIALLY CARCINOGENIC CHEMICALS. SFS ARE DERIVED FROM THE RESULTS OF HUMAN EPIDEMIOLOGICAL STUDIES OR CHRONIC ANIMAL BIOASSAYS TO WHICH ANIMAL-TO-HUMAN EXTRAPOLATION AND UNCERTAINTY FACTORS HAVE BEEN APPLIED. SFS, WHICH ARE EXPRESSED IN UNITS OF (MG/KG-DAY)(-1), ARE MULTIPLIED BY THE ESTIMATED INTAKE OF A POTENTIAL CARCINOGEN TO PROVIDE AN UPPER-BOUND ESTIMATE OF THE EXCESS LIFETIME CANCER, RISK ASSOCIATED WITH EXPOSURE AT THAT INTAKE LEVELS. THE TERM "UPPERBOUND" REFERS TO THE CONSERVATIVE ESTIMATE OF THE RISKS CALCULATED FROM THE SF. THIS APPROACH MAKES UNDERESTIMATION OF THE ACTUAL CANCER RISK HIGHLY UNLIKELY. SINCE QUANTITATION OF DERMAL EXPOSURE RESULTS IN AN ABSORBED DOSE THE ADMINISTERED DOSE ORAL SF MUST BE ADJUSTED ACCORDINGLY. TABLE 41 LISTS ALL CARCINOGENIC CONTAMINANTS OF CONCERN ALONG WITH RESPECTIVE CANCER CLASSIFICATIONS AND SLOPE FACTORS.

NONCARCINOGENS

REFERENCE DOSES (RFDS) HAVE BEEN DEVELOPED BY EPA FOR INDICATING THE POTENTIAL FOR ADVERSE HEALTH EFFECTS OTHER THAN CANCER. RFDS, WHICH ARE EXPRESSED IN UNITS OF (MG/KG-DAY), ARE ESTIMATE OF CHRONIC DAILY EXPOSURE FOR HUMANS, INCLUDING SENSITIVE INDIVIDUALS, THAT ARE THOUGHT TO BE FREE OF ANY ADVERSE EFFECT. RFDS ARE DERIVED FROM HUMAN EPIDEMIOLOGICAL DATA OR EXTRAPOLATED FROM ANIMAL STUDIES TO WHICH UNCERTAINTY FACTORS HAVE BEEN APPLIED. THESE UNCERTAINTY FACTORS HELP ENSURE THAT THE RFDS WILL NOT UNDERESTIMATE THE POTENTIAL FOR ADVERSE NONCARCINOGENIC EFFECTS TO OCCUR. ESTIMATED INTAKE OF CHEMICALS FROM ENVIRONMENTAL MEDIA CAN BE COMPARED TO THE RFD FOR EACH OF THE CONTAMINANTS. AS WITH THE SFS, ORAL RFDS MUST BE ADJUSTED FOR DERMAL EXPOSURE.

TABLE 42 LISTS ALL CONTAMINANTS OF CONCERN WITH THEIR RESPECTIVE RFDS

D. RISK CHARACTERIZATION SUMMARY

LIFETIME EXCESS CANCER RISKS (LECR) ARE DETERMINED BY MULTIPLYING THE CHRONIC DAILY INTAKE (CDI) BY THE SLOPE FACTOR. LECRS ARE PROBABILITIES THAT ARE GENERALLY EXPRESSED IN SCIENTIFIC NOTATION (E.G., 1 X (10-6) OR 1E-06). A LECR OF 1E-06 INDICATES THAT, AS AN UPPERBOUND ESTIMATE, AN INDIVIDUAL HAS A ONE IN ONE MILLION CHANCE OF DEVELOPING CANCER IN HIS/HER LIFETIME AS A RESULT OF EXPOSURE TO A SITE RELATED CARCINOGEN UNDER THE SPECIFIC EXPOSURE CONDITIONS AT A SITE.

THE POTENTIAL FOR NONCARCINOGENIC EFFECTS FROM A SINGLE CONTAMINANT IN A SINGLE MEDIUM IS EXPRESSED AS A HAZARD QUOTIENT (HQ). THEE HQ IS THE RATIO OF THE ESTIMATED HUMAN INTAKE TO THE RFD FOR A PARTICULAR CONTAMINANTS. BY ADDING THE HQS FOR ALL CONTAMINANTS WITHIN A MEDIUM AND THEN ACROSS ALL MEDIA TO WHICH A GIVEN POPULATION MAY REASONABLY EXPOSED, THE HAZARD INDEX (HI) CAN BE GENERATED. THE HI PROVIDES A USEFUL REFERENCE POINT FOR ASSESSING THE POTENTIAL SIGNIFICANCE OF EXPOSURE TO MULTIPLE CONTAMINANTS ACROSS MULTIPLE MEDIA.

EPA'S TARGETED LECR RANGE FOR CLEANUP OF SUPERFUND SITES IS (1E-04) TO (1-06). LECRS LESS THAN (1E-06) ARE DEEMED ACCEPTABLE AND THOSE GREATER THAN (1E-04) ARE UNACCEPTABLE TO EPA. LECRS THAT FALL BETWEEN (1E-04) AND (1E-06) MAY OR MAY NOT WARRANT ACTION, DEPENDING ON SITE-SPECIFIC FACTORS CONSIDERED BY THE RISK MANAGER. NONCARCINOGENIC HI VALUES GREATER THAN 1.0 INDICATE THAT REMEDIAL ACTION SHOULD BE TAKEN.

THE RESULTANT LECRS AND HI FOR THE CURRENT AND FUTURE LAND USE SCENARIOS ARE SHOWN IN TABLE 43. THE ONLY SITE AREAS TO EXCEED (1E-06) LECR FOR THE CURRENT USE SCENARIO ARE THE UPPER AND LOWER MACON AREAS (6.21E-05 AND 4.20E-05, RESPECTIVELY). THESE LECRS ARE PRIMARILY DUE TO EXPOSURE TO SOIL CONTAINING ARSENIC (UPPER MACON) AND PAHS (LOWER MACON). NO HI EXCEEDS 1.0 FOR THE CURRENT USE SCENARIO.

THE TOTAL LECR AND HI FOR THE FUTURE USE (RESIDENTIAL) SCENARIO ARE SHOWN FOR EACH OF THE SITE AREAS IN TABLE 44 ALONG WITH THE CONTAMINANTS RESPONSIBLE FOR THE MAJOR OF THE LECR/HI.

UNCERTAINTIES

THE RISK ASSESSMENT PROCESS CONTAINS INHERENT UNCERTAINTIES. EXPOSURE PARAMETERS SUCH A FREQUENCY AND DURATION OF EXPOSURE AND INGESTION RATE OF CONTAMINATED MEDIA CAN VARY BETWEEN INDIVIDUALS. THEREFORE, UPPERBOUND VALUES WERE USED TO ESTIMATE EXPOSURE, IN ORDER TO BE MORE PROTECTIVE OF HUMAN HEALTH. SLOPE FACTORS AND REFERENCE DOSES EACH INVOLVE EXTRAPOLATION TO WHICH CONSERVATIVE UNCERTAINTY FACTORS ARE ADDED IN ORDER TO BE PROTECTION OF SENSITIVE HUMANS.

E. ENVIRONMENTAL (ECOLOGICAL) RISKS

THE SITE CONSISTS OF OAK-PINE FOREST OVER MOST OF THE UPLAND PORTIONS OF THE SITE, WITH BOTTOMLAND HARDWOOD WETLANDS ALONG SOLOMON'S CREEK. TERRESTRIAL WILDLIFE ON AND AROUND THE SITE INCLUDE WHITE-TAILED DEER, RACOON, OPOSSUM, EASTERN COTTONTAIL RABBIT, AND BOB-WHITE QUAIL. COMMON DUCK AND WADING BIRD SPECIES FREQUENT THE WETLANDS ALONG SOLOMON'S CREEK AND SEVERAL FISH SPECIES INHABIT THE PEE DEE RIVER.

TO DETERMINE WHETHER THE SITE MAY HAVE ADVERSE EFFECTS ON ENVIRONMENTAL RECEPTORS, THE "QUOTIENT METHOD" WAS USED, WHEREBY EXPOSURE VALUES WERE COMPARED TO EXPERIMENTALLY DERIVED NO OBSERVED AVERSE EFFECT LEVELS (NOAEL) OR LOWEST OBSERVED ADVERSE EFFECT LEVELS (LOAEL) IN TOXICITY DATABASES. THIS COMPARISON INDICATED THAT SEVERAL INORGANIC CONSTITUENTS, INCLUDING MERCURY, BERYLLIUM, ZINC, BARIUM, MANGANESE, CADMIUM, IRON, LEAD, IN SOIL AND SURFACE WATER AT THE VARIOUS SITE AREA COULD POSSIBLY POSE SOME THREAT TO AREA WILDLIFE.

7. APPLICATION OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

THE ENVIRONMENTAL SETTING AND THE EXTENT AND CHARACTERISTICS OF THE CONTAMINATION AT THE MACON/DOCKERY SITE WERE DEFINED IN SECTION 1 AND SECTION 5, RESPECTIVELY. SECTION 6 HIGHLIGHTS THE PRIMARY ENVIRONMENTAL MEDIA OF CONCERN AND THE HUMAN HEALTH AND ENVIRONMENTAL RISKS POSED BY THE SITE. SECTION 6 CONTAINS LISTS OF THE CONTAMINANTS OF CONCERN PRESENT IN THE GROUNDWATER AND SOILS AT THE SITE. THIS SECTION EXAMINES THE CLEANUP CRITERIA (ARARS) ASSOCIATED WITH THE CONTAMINANTS FOUND ON-SITE AND THE ENVIRONMENTAL MEDIA CONTAMINATED.

A. ACTION-SPECIFIC REQUIREMENTS SET CONTROLS/RESTRICTIONS ON THE DESIGN, PERFORMANCE, AND OTHER ASPECT FOR IMPLEMENTING A SPECIFIC REMEDIAL ACTIVITY. SINCE ACTION-SPECIFIC ARARS APPLY TO DISCRETE REMEDIAL ACTIVITIES, THEY ARE DISCUSSED IN GREATER DETAIL IN SECTION 8. THE THREE CATEGORIES FOR ACTION-SPECIFIC ARARS ARE:

- ARARS FOR ACTIONS TAKEN IN ALL ALTERNATIVES;
- ARARS FOR AN ACTION INVOLVING SOIL TREATMENT; AND
- ARARS FOR AN ACTION INVOLVING GROUNDWATER TREATMENT.

THE FIRST CATEGORY SPECIFIES REQUIREMENTS FOR SAFETY AND HEALTH, HAZARDOUS WASTE FACILITIES, AND TRANSPORTATION. THE SECOND CATEGORY COVERS SOIL VAPOR EXTRACTION, CAPPING, AND RELATED AIR EMISSIONS. THE LAST CATEGORY APPLIES TO THE EXTRACTION AND TREATMENT OF GROUNDWATER, THE DISCHARGE OF THE TREATED GROUNDWATER, AND RELATED AIR EMISSIONS.

B. CHEMICAL-SPECIFIC ARARS

CHEMICAL-SPECIFIC ARARS ARE CONCENTRATION LIMITS IN THE ENVIRONMENT PROMULGATED BY GOVERNMENT AGENCIES. HEALTH-BASED SITE-SPECIFIC LEVELS MUST BE DEVELOPED FOR CHEMICALS OR MEDIA WHERE SUCH LIMITS DO NOT EXIST AND THERE IS A CONCERN WITH THEIR POTENTIAL HEATH OR ENVIRONMENTAL IMPACTS. POTENTIAL CHEMICAL-SPECIFIC ARARS ARE DISCUSSED BY MEDIA BELOW.

GROUNDWATER

POTENTIAL ARARS FOR GROUND WATER INCLUDE MAXIMUM CONTAMINANT LEVELS (MCLS), NORTH CAROLINA DRINKING WATER STANDARDS, AND NORTH CAROLINA GROUNDWATER STANDARD. SOME CHEMICALS AT THE SITE LACKED ESTABLISHED GROUNDWATER QUALITY CRITERIA FOR CONSIDERATION IN DEVELOPING REMEDIAL ALTERNATIVES. CONSEQUENTLY, REMEDIATION LEVELS WERE CALCULATED FOR THESE CHEMICALS USING THE PRELIMINARY POLLUTANT LIMIT VALUE (PPLV) APPROACH.

MAXIMUM CONTAMINANT LEVELS (MCLS)

SITE GROUND WATER IS CONSIDERED A CURRENT SOURCE OF DRINKING WATER UNDER FEDERAL GUIDELINES (CLASS IIA) AND AS CLASS GA UNDER NORTH CAROLINA STATE GUIDELINES. THE NCP STATES THAT MAXIMUM CONTAMINANT LEVELS (MCLS), ESTABLISHED UNDER THE SAFE DRINKING WATER ACT (SDWA), ARE POTENTIALLY RELEVANT AND APPROPRIATE GROUNDWATER STANDARDS FOR THE REMEDIATION OF CURRENT OR POTENTIAL SOURCES OF DRINKING WATER (300.430(E)(2)(I)(A)). MCLS AND PROPOSED MCLS FOR MACON/DOCKERY SITS GROUND WATER CHEMICALS ARE PROVIDED IN TABLE 45. IN ADDITION, THE TABLE PRESENTS THE MAXIMUM GROUNDWATER CONCENTRATION FOR A PARTICULAR CHEMICAL AND ITS ASSOCIATED SAMPLING LOCATION AS DETERMINED BY THE RI

NORTH CAROLINA GROUND WATER STANDARDS

NORTH CAROLINA DRINKING WATER STANDARDS (10 NCAC 10D) ARE ESSENTIALLY IDENTICAL TO THE SDWA MCLS ESTABLISHED BY THE EPA (TABLE 45). NORTH CAROLINA GROUND WATER STANDARDS (NORTH CAROLINA ADMINISTRATIVE CODE (NCAC) TITLE 15A, CHAPTER 2, SUBCHAPTER 2L) FOR CLASS GA GROUND WATER ARE GENERALLY MORE STRINGENT THAN MCLS AND ARE POTENTIALLY APPLICABLE. DRINKING WATER STANDARDS ARE EQUAL OR LESS STRINGENT THAN THE NORTH CAROLINA GROUNDWATER STANDARDS.

PRELIMINARY POLLUTANT LIMIT VALUE.

AS SEEN ON TABLE 45, THREE CHEMICALS IN THE GROUND WATER LACK ESTABLISHED WATER QUALITY CRITERIA FOR CONSIDERATION IN DEVELOPING REMEDIAL ALTERNATIVES. THESE ARE ACETONE, 1,1-DICHLOROETHANE, AND ISOPHORONE.

GROUND WATER QUALITY LEVELS FOR THESE REMAINING COMPOUNDS ARE HEALTH BASED RISK LEVELS, WHERE AVAILABLE. ORAL REFERENCE DOSES (RFD) ARE USED FOR NONCARCINOGENS WHILE ORAL CANCER POTENCY FACTORS ARE USED FOR CARCINOGENS. CALCULATION OF GROUNDWATER QUALITY LEVELS IS BASED ON THE FOLLOWING EPA FACTORS;

- 70 KG BODY WEIGHT
- 2 LITERS PER DAY INGESTION
- (10-5) RISK LEVEL (CARCINOGENS).

PPLVS WERE CALCULATED FOR 3 OF THE 4 CHEMICALS. THE RESULTING PPLVS ARE LISTED IN TABLE 45.

IT WAS NOT POSSIBLE TO CALCULATE A PPLV OR FIND ANY QUANTITATIVE RISK INFORMATION ABOUT CHLOROETHANE. BASED ON THE INFORMATION FOUND AND ON THE LOCALIZED, LOW CONCENTRATIONS OF CHLOROETHANE AT THE UPPER MACON SITE, IT WAS DETERMINED THAT CHLOROETHANE IS NOT A CHEMICAL OF SIGNIFICANT CONCERN AT THE SITE.

GROUNDWATER REMEDIATION LEVELS

GROUNDWATER REMEDIATION LEVELS FOR THE MACON/DOCKERY SITE WILL BE THE MOST STRINGENT STANDARD LISTED IN TABLE 45. TABLE 46 PRESENTS THE GROUNDWATER CHEMICALS OF CONCERN AND THEIR ASSOCIATED REMEDIATION LEVEL.

SURFICIAL SOILS

THE CURRENT-USE RISK ASSESSMENT DETERMINED RISK LEVELS FOR SURFICIAL SOILS. FOR CARCINOGENS, AN ACCEPTABLE RISK IS (10E-4) TO (10E-6) (OR BELOW) AND FOR NON-CARCINOGENS, A HI LESS THAN 1. CARCINOGENIC RISKS FOR SITE SURFACE SOIL WERE SLIGHTLY EXCEEDED AT THE UPPER AND LOWER MACON SITE (TABLE 43), PRIMARILY AS A RESULT OF ARSENIC. NO SURFICIAL SOIL HAD A HI GREATER THAN ONE. ARSENIC WAS DETECTED AT THE UPPER MACON SITE FROM 1.9 TO 5.8 PPM AND AT THE LOWER MACON SITE FROM 0.88 TO 3.9 PPM WHILE AVERAGE BACKGROUND CONCENTRATION FOR ARSENIC WAS 3 PPM AT THE SITE. THERE ARE NO PROMULGATED FEDERAL OR STATE STANDARDS APPLICABLE FOR CONTAMINANTS DETECTED IN SURFACE SOIL AT THE SITE. HOWEVER, A RELEVANT AND APPROPRIATE ARAR FOR SURFACE SOILS IS RCRA

SOIL ACTION LEVELS (40 CFR PART 264.521 (A)(2)(I-IV)). THE RCRA SOIL ACTION LEVEL FOR ARSENIC (NON-CARCINOGENIC, SYSTEMIC RISKS) IS 80 MG/KG WHILE THE MAXIMUM ARSENIC CONCENTRATION FOR SURFACE SOILS AT THE UPPER MACON SITE WAS 5.8 N MG/KG (N INDICATES THAT THE SPIKED SAMPLE RECOVERY WAS OUTSIDE OF CONTROL LIMITS) AND 3.9 MG/KG AT THE LOWER MACON SITE. IN ADDITION, THERE IS A DEGREE OF UNCERTAINTY ASSOCIATED WITH THE POTENTIAL RISKS POSED BY EXPOSURE TO TRACE LEVEL OF ARSENIC IN THE SITE SURFACE SOIL, AS DISCUSSED IN THE RISK ASSESSMENT. FOR THESE REASONS, THE SURFICIAL SOILS AT THE MACON SITE DO NOT REQUIRE REMEDIATION. CONSEQUENTLY, REMEDIATION OF SURFICIAL SOILS AT THE SITE WILL NOT BE CONSIDERED.

SUBSURFACE SOILS

REMEDIATION LEVELS FOR SUBSURFACE SOILS THAT ARE ABOVE THE GROUND WATER ARE BASED ON A COMPOUND'S POTENTIAL TO IMPACT GROUND WATER. CONCENTRATIONS OF CHEMICALS IN SUBSURFACE SOIL THAT ARE PROTECTIVE OF GROUND WATER WERE DEVELOPED USING THE VADOSE ZONE INTERACTIVE PROCESSES (VIP) MODEL.

THIS MODEL WAS DEVELOPED BY EPA'S KERR ENVIRONMENTAL LABORATORY (ADA, OKLAHOMA) AND THE CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT OF UTAH STATE UNIVERSITY (LOGAN, UTAH). THE VIP MODEL WAS DEVELOPED TO ACCURATELY PREDICT THE FATE AND TRANSPORT OF COMPOUNDS IN THE VADOSE ZONE OF SOIL.

DETAILS ABOUT THE MODELING, INCLUDING INPUT PARAMETERS, ARE PROVIDED IN APPENDIX E OF THE FS.

POTENTIAL REMEDIATION LEVELS FOR VADOSE ZONE SOILS ARE PROVIDED IN TABLES 47 THROUGH 51 FOR THE SITE. THESE TABLES PRESENT THE VADOSE CONCENTRATION FOR A CHEMICAL AND ITS ESTIMATED CONCENTRATION IN, AND TIME OF TRAVEL TO THE WATER TABLE. FOR COMPOUNDS THAT ARE ESTIMATED TO MIGRATE TO THE GROUND WATER, THE ESTIMATED CONCENTRATION AND ITS REGULATORY LIMIT (IF ANY) ARE PRESENTED FOR COMPARISON. FOR THREE COMPOUNDS FOUND IN THE GROUND WATER (ACETONE, ISOPHORONE, AND 1,1-DICHLOROETHANE), PPLVS WERE USED FOR COMPARISON SINCE NO MCL VALUES WERE AVAILABLE. THE DERIVATION OF PPLVS FOR THESE COMPOUNDS IS PROVIDED IN APPENDIX D OF THE FS.

UPPER MACON SITE

POTENTIAL SUBSURFACE SOIL REMEDIATION LEVELS FOR THE UPPER MACON SITE ARE PROVIDED IN TABLE 47. THE VIP MODEL ESTIMATED THAT FIVE ORGANIC COMPOUND WOULD REACH THE GROUND WATER FROM THE VADOSE ZONE ABOVE DETECTION LIMITS: ACENAPHTHENE, ISOPHORONE, ACETONE, ETHYLBENZENE, AND TETRACHLOROETHENE (PCE). ONLY THREE OF THE COMPOUNDS WERE FOUND IN THE GROUND WATER: ISOPHORONE AT 2 UG/L (VIP PREDICTED 4 UG/L), ACETONE AT 42 UG/L (VIP PREDICTED 33 UG/L), AND TETRACHLOROETHENE AT 44 UG/L (VIP PREDICTED FROM 2 TO 80 UG/L). THE OTHER COMPOUNDS WERE NOT DETECTED IN GROUND WATER.

COMPARISON OF TABLE 26 (GROUND WATER, UPPER MACON) WITH TABLE 47 (VADOSE ZONE, UPPER MACON) SHOWS THAT SOME COMPOUNDS WERE DETECTED IN THE GROUND WATER BUT NOT IN THE VADOSE ZONE. FOR EXAMPLE, VINYL CHLORIDE (A DEGRADATION PRODUCT OF CHLORINATED ALIPHATIC COMPOUNDS SUCH AS PCE) WAS FOUND IN THE GROUND WATER AT THE UPPER MACON SITE AT A MAXIMUM CONCENTRATION OF 510 UG/L BUT NOT IN THE VADOSE ZONE. OTHER EXAMPLES INCLUDE CHLOROETHANE (POSSIBLY A DEGRADATION PRODUCT OF TRICHLOROETHENE) AND 1,1-DICHLOROETHENE.

CONSEQUENTLY, IT APPEARS AS THOUGH VOLATILE ORGANIC COMPOUNDS IN THE UPPER MACON VADOSE ZONE MAY CONTINUE TO IMPACT THE GROUND WATER. SPECIFICALLY, PCE AND VINYL CHLORIDE ARE THE COMPOUNDS OF CONCERN. PCE MAY IMPACT THE GROUND WATER DIRECTLY (AS PCE) OR INDIRECTLY, BY SERVING AS THE PARENT COMPOUND FOR THE FORMATION OF VINYL CHLORIDE.

CERTAIN METALS IN THE VADOSE ZONE OF THE UPPER MACON SITE APPEAR TO BE SLIGHTLY ABOVE BACKGROUND LEVELS (TABLE 25). SITE-SPECIFIC MODELING (VIP) INDICATES THAT THESE METALS WILL NOT MIGRATE TO ANY SIGNIFICANT DEGREE NOR ARE THEY EXPECTED TO ADVERSELY IMPACT THE SITE GROUND WATER. HOWEVER, THE VIP MODEL USES CERTAIN ASSUMPTIONS AND INPUT PARAMETERS. ASSUMPTIONS USED IN THE MODELING MAY UNDERESTIMATE OR OVERESTIMATE METALS MIGRATION. FOR THIS REASON, IT IS POSSIBLE THAT THE MODELING UNDERESTIMATED THE POTENTIAL IMPACT OF METALS IN THE VADOSE ZONE ON THE GROUND WATER. THUS, THERE IS A LIMITED POTENTIAL THAT CERTAIN METALS MAY IMPACT THE GROUND WATER ABOVE NATURALLY-OCCURRING METALS CONCENTRATIONS.

LOWER MACON SITE

BECAUSE OF THE DIFFERENCES IN WASTE MATERIALS BETWEEN LAGOON 10 AND LAGOON 11 THEY WERE MODELED SEPARATELY USING THE VIP MODEL. POTENTIAL REMEDIATION LEVELS FOR THE LOWER MACON SITE LAGOON 10 ARE PROVIDED IN TABLE 48. THE VIP MODEL ESTIMATED THAT SEVEN ORGANIC COMPOUNDS WOULD IMPACT THE GROUND WATER: BENZOIC ACID, ACENAPHTHENE, DI-N-BUTYL PHTHALATE, ACETONE, ETHYLBENZENE, STYRENE, AND TOLUENE. HOWEVER, ONLY ACETONE AND BENZOIC ACID WERE DETECTED IN THE GROUND WATER AT THE LOWER MACON SITE (TABLE 48). VIP MODELING FOR LAGOON 11 PREDICTED THAT ACENAPHTHENE WOULD IMPACT THE GROUND WATER AT THE LOWER MACON SITE. HOWEVER ACENAPHTHENE WAS NOT DETECTED IN THE LOWER MACON SITE GROUND WATER.

MATERIAL FROM LAGOON 10 AT THE LOWER MACON SITE CONTAINS SOME OF THE HIGHEST CHEMICAL CONCENTRATIONS ON SITE. LAGOON 10 CONTAINS VARIOUS ORGANIC WASTES, INCLUDING 950 TONS OF CREOSOTE AND SOLIDIFIED SLUDGE COLLECTED DURING EPA'S IMMEDIATE REMOVAL ACTION. CREOSOTE IS A COMPLEX MIXTURE OF COMPOUNDS, PRIMARILY POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) AND PHENOLIC SUBSTANCES. THE MAJOR PAHS IN CREOSOTE ARE 2, 3, 4 AND 5-RING COMPOUNDS, INCLUDING NAPHTHALENE, ACENAPHTHENE, FLUORENE, ANTHRACENE, PHENANTHRENE, FLUORANTHENE, PYRENE AND BENZO(A)PYRENE, ALL OF WHICH WERE DETECTED IN SAMPLES COLLECTED FORM LAGOON 10. PAHS TYPICALLY EXHIBIT LOW VOLATILITY, LOW AQUEOUS SOLUBILITY AND ADSORB ONTO SOILS. THE RISKS TO GROUND WATER POSED BY THESE COMPOUNDS IS MINIMAL SINCE THEY ARE RELATIVELY IMMOBILE IN SOILS (VIP MODEL) AND ARE LOCATED AT LEAST 21 FEET ABOVE THE WATER TABLE. IN ADDITION, A TEMPORARY SOIL/POLYETHYLENE CAP WAS PLACED ON LAGOON 10 DURING THE INTERIM REMEDIATION.

CADMIUM APPEARS TO BE THE ONLY METAL THAT IS SLIGHTLY ELEVATED IN THE LOWER MACON VADOSE ZONE (SEE TABLE 25).

UPPER DOCKERY SITE

THE UPPER DOCKERY SITE DOES NOT CONTAIN ANY FORMER LAGOONS. HOWEVER, IT REPORTEDLY SERVED AS A DRUM STORAGE AREA. VADOSE ZONE CONTAMINATION AT THE UPPER DOCKERY SITE IS MOST LIKELY RELATED TO REPORTED DRUM STORAGE.

POTENTIAL REMEDIATION LEVELS FOR THE UPPER DOCKERY SITE ARE PROVIDED IN TABLE 50. THE VIP MODEL ESTIMATED THAT FIVE ORGANIC COMPOUNDS COULD IMPACT THE GROUND WATER: DIETHYL PHTHALATE, DIMETHYL PHTHALATE, ACETONE, METHYLENE CHLORIDE, AND 4-METHYL-2-PENTANONE.

CERTAIN METALS IN THE VADOSE ZONE OF THE UPPER MACON SITE APPEAR TO BE SLIGHTLY ABOVE BACKGROUND LEVELS (TABLE 25).

LOWER DOCKERY SITE

POTENTIAL REMEDIATION LEVELS FOR THE LOWER DOCKERY SITE ARE PROVIDED IN TABLE 51. THE VIP MODEL ESTIMATED THAT ACETONE WOULD BE FOUND IN THE GROUND WATER AT 4 UG/L, WELL BELOW ITS PPLV OF 3500 UG/L. HOWEVER, ACETONE WAS NOT DETECTED IN THE LOWER DOCKERY SITE GROUND WATER (TABLE 48). SIX ORGANIC COMPOUNDS WERE DETECTED IN THE LOWER DOCKERY SITE GROUNDWATER: BIS(2-ETHYLHEXYL)PHTHALATE, CHLOROFORM, 1,1-DICHLOROETHANE, 1,1-DICHLOROETHENE, AND TRICHLOROETHENE, AND 1,1,1-TRICHLOROETHANE (TABLE 31).

CERTAIN METALS IN THE VADOSE ZONE OF THE LOWER MACON SITE APPEAR TO BE SLIGHTLY ABOVE BACKGROUND LEVELS (TABLE 25).

SURFACE WATERS

SURFACE WATER FROM THE SITE DRAINS INTO SOLOMONS CREEK AND FINALLY INTO THE PEE DEE RIVER. POTENTIAL ARARS FOR SURFACE WATER INCLUDE FEDERAL AMBIENT WATER QUALITY CRITERIA (AWQC, 1986). AS SEEN IN TABLE 43, THE CURRENT USE AND PREDICTED FUTURE CARCINOGENIC AND NON-CARCINOGENIC RISKS ASSOCIATED WITH SITE SURFACE WATERS WERE ALL WITHIN ACCEPTABLE RISKS. THEREFORE, REMEDIATION OF SURFACE WATER AT THE SITE IS NOT NECESSARY.

SEDIMENTS

THERE ARE NO PROMULGATED FEDERAL OR STATE QUALITY STANDARDS FOR SEDIMENTS. HOWEVER, AS SEEN IN TABLE 43, THE CURRENT USE AND PREDICTED FUTURE CARCINOGENIC AND NON-CARCINOGENIC RISKS ASSOCIATED WITH SITE SEDIMENTS WERE ALL WITHIN ACCEPTABLE RISKS. THEREFORE, REMEDIATION OF SEDIMENT AT THE SITE IS NOT NECESSARY.

VESSELS

THERE ARE SEVERAL VESSELS ON THE MACON SITE (TANKS, TANKERS, AND VATS) THAT CONTAIN WASTE MATERIALS. A RELEVANT AND APPROPRIATE REQUIREMENT FOR OFF-SITE DISPOSAL OF VESSEL CONTENTS IS RCRA (RESOURCE CONSERVATION AND RECOVERY ACT) GUIDANCE. AS A PRELIMINARY STEP FOR IDENTIFYING OFF-SITE DISPOSAL ALTERNATIVES, RCRA GUIDANCE WAS USED TO DETERMINE IF THE VESSEL CONTENTS WERE HAZARDOUS ACCORDING TO THE TOXICITY CHARACTERISTICS LEACHING PROCEDURE (TCLP) AND SELECTED HAZARD CHARACTERISTICS (I.E., IGNITABILITY AND CORROSIVITY). CONSEQUENTLY, VESSEL CONTENTS WERE SAMPLED AND ANALYZED FOR THOSE PARAMETERS. RESULTS OF THE SAMPLING AND ANALYSIS WERE PRESENTED IN TABLE 37. ONLY 3 VESSELS CONTAINED WASTE THAT COULD BE CONSIDERED HAZARDOUS FOR OFFSITE DISPOSAL UNDER RCRA GUIDANCE: SOLIDS IN VAT 4 (TCLP LEAD AT 7 MG/L), OIL IN TANK 3 (TCLP LEAD AT 15 MG/L), AND OIL IN TANK 4 (TCLP LEAD AT 10 MG/L). THE OIL IN TANKS 3 AND 4 IS MOST LIKELY USED ENGINE OIL THAT WAS CONTAMINATED WITH TETRAETHYL LEAD (FORMER ANTIKNOCK AGENT IN GASOLINE). USED OIL IS CURRENTLY NOT CONSIDERED A HAZARDOUS WASTE. CONTENTS OF THE REMAINING VESSELS ARE NOT CONSIDERED HAZARDOUS WASTES. OFF-SITE REMEDIAL ALTERNATIVES FOR THE VESSELS WILL CONSIDER THESE DATA AND RCRA GUIDANCE. ADDITIONAL CHARACTERIZATION MAY BE NECESSARY DEPENDING ON THE WASTE DISPOSAL METHOD THAT IS SELECTED.

C. LOCATION-SPECIFIC ARARS

LOCATION-SPECIFIC ARARS MUST CONSIDER FEDERAL, STATE, AND LOCAL REQUIREMENTS THAT REFLECT THE PHYSIOGRAPHICAL AND ENVIRONMENTAL CHARACTERISTICS OF THE SITE OR THE IMMEDIATE AREA. REMEDIAL ACTIONS MAY BE RESTRICTED OR PRECLUDED DEPENDING ON THE LOCATION OR CHARACTERISTICS OF THE SITE AND THE RESULTING REQUIREMENTS. A LISTING OF POTENTIAL LOCATION-SPECIFIC ARARS AND THEIR CONSIDERATION ARE IN TABLE 52.

D. AREAS OF POTENTIAL REMEDIATION

SITE MEDIA THAT POSE SIGNIFICANT RISKS TO HUMAN HEALTH AND THE ENVIRONMENT AND/OR EXCEED ARARS REPRESENT AREAS OF POTENTIAL REMEDIATION. POTENTIAL HUMAN HEALTH AND ENVIRONMENTAL RISKS WERE EVALUATED IN THE RISK ASSESSMENT. THE FOLLOWING SECTIONS DISCUSS THE SPECIFIC AREAS OF POTENTIAL REMEDIATION.

GROUND WATER

THE RESULTS OF THE RI AND THE PREDICTED FUTURE RESIDENTIAL USE SCENARIO (TABLE 43) INDICATE THAT GROUND WATER EXCEEDS RISK LEVELS AT THE SITE.

SURFICIAL SOILS

SURFICIAL SOILS AT THE SITE DO NOT REQUIRE REMEDIATION.

SUBSURFACE SOILS

ONE POTENTIAL NEED FOR REMEDIATION OF SUBSURFACE SOILS IS BASED ON THE ABILITY OF A CHEMICAL TO MIGRATE (THROUGH LEACHING) AND THEREBY IMPACT GROUND WATER AT CONCENTRATIONS EXCEEDING GROUNDWATER ARARS.

ONLY THE VADOSE ZONE AT THE UPPER MACON SITE (I.E., LAGOON 7) REQUIRES REMEDIATION TO MITIGATE THE POTENTIAL EFFECTS ON GROUND WATER OF VOLATILE ORGANIC COMPOUNDS. REMEDIATION OF OTHER VADOSE ZONE SOILS FOR GROUNDWATER IS NOT REQUIRED, FOR THE FOLLOWING REASONS:

- CONTAMINANT SLUGS HAVE ALREADY PASSED THROUGH THE VADOSE ZONE
- FURTHER SLUGS OF CONTAMINATION HAVE BEEN ELIMINATED BY THE REMOVAL OF THE CONCENTRATED SOURCE AREAS DURING THE INTERIM REMEDIATION CONDUCTED BY THE EPA
- INORGANIC CHEMICALS REMAINING IN THE VADOSE ZONE, ALTHOUGH ABOVE BACKGROUND LEVELS, ARE NOT EXPECTED TO ADVERSELY IMPACT THE GROUND WATER; HOWEVER, DURING REMEDIAL DESIGN, FURTHER EVALUATION OF THE POTENTIAL FOR IMPACTING GROUNDWATER WILL BE EVALUATED FOR BUT NOT LIMITED TO CHROMIUM
- ORGANIC CHEMICALS REMAINING IN THE VADOSE ZONE ARE NOT EXPECTED TO ADVERSELY IMPACT

THE GROUND WATER; HOWEVER, DURING REMEDIAL DESIGN, FURTHER EVALUATION OF THE POTENTIAL FOR LEACHING AT LEVELS THAT ADVERSELY IMPACT GROUNDWATER WILL BE EVALUATED

- THERE IS NO DIRECT EXPOSURE ROUTE FROM VADOSE ZONE CHEMICALS TO HUMANS OR THE ENVIRONMENT

- IN THE UNLIKELY EVENT THAT CONTAMINANTS MIGRATE FROM THE VADOSE ZONE TO GROUND WATER ABOVE MCLS, THEY COULD BE CAPTURED AND REMOVED FROM THE GROUND WATER BY GROUND WATER EXTRACTION

MATERIAL FROM LAGOON 10 AT THE LOWER MACON SITE CONTAINS RELATIVELY CONCENTRATED LEVELS OF PAHS IN THE WASTE. LAGOON 10 IS COVERED BY A TEMPORARY CAP THAT WAS BUILT DURING THE INITIAL SITE REMEDIATION IN 1982-1983. SINCE THIS CAP IS TEMPORARY, THERE IS THE POSSIBILITY THAT THE CAP COULD FAIL, THUS POTENTIALLY EXPOSING HUMANS AND THE ENVIRONMENT TO IMPACT FROM THESE WASTES. CONSEQUENTLY, LAGOON 10 REQUIRES REMEDIATION.

AS DISCUSSED, THE VADOSE ZONE AT THE UPPER MACON SITE MAY ADVERSELY IMPACT THE GROUND WATER (PCE AT FORMER LAGOON 7) WHILE THE VADOSE ZONE AT THE LOWER MACON SITE (I.E., LAGOON 10) MAY RESULT IN FUTURE EXPOSURE TO THE BURIED PAH COMPOUNDS. THE ESTIMATED VOLUME AT LAGOON 7 THAT WOULD REQUIRE REMEDIATION IS 1300 CUBIC YARDS. THE ESTIMATED VOLUME OF REMEDIATION AT LAGOON 10 IS 1000 CUBIC YARDS. WASTE AT LAGOON 10 IS ESTIMATED TO BE FROM 2 TO 10 FEET BELOW THE LAND SURFACE.

SURFACE WATER

SURFACE WATER AT THE SITE DOES NOT REQUIRE REMEDIATION.

SEDIMENTS

SEDIMENT AT THE SITE DOES NOT REQUIRE REMEDIATION.

VESSELS

A RELEVANT AND APPROPRIATE REQUIREMENT FOR OFF-SITS DISPOSAL OF VESSEL CONTENTS IS RCRA GUIDANCE. ADDITIONAL CHARACTERIZATION MAY BE NECESSARY DEPENDING ON THE DISPOSAL ALTERNATIVES THAT ARC CONSIDERED.

8. DESCRIPTION OF ALTERNATIVES

TABLES 53 AND 54 SUMMARIZE THE TECHNOLOGIES CONSIDERED FOR REMEDIATING/CONTROLLING GROUNDWATER AND SOURCE CONTAMINATION, RESPECTIVELY AT THE MACON/DOCKERY SITE. THESE TABLES ALSO PROVIDE THE RATIONALE AS TO WHY CERTAIN TECHNOLOGIES WERE NOT RETAINED FOR FURTHER CONSIDERATION AFTER THE INITIAL SCREENING. SURFACE WATER/SEDIMENT REMEDIATION TECHNOLOGIES WERE NOT EVALUATED AS THIS ENVIRONMENTAL MEDIUM HAS NOT BEEN IMPACTED BY THE SITE NOR IS IT EXPECTED TO BE IN THE FUTURE. ALTHOUGH AIR IS NOT A PRESENT EXPOSURE PATHWAY, IT MAY POSE A RISK DURING THE IMPLEMENTATION OF EITHER THE GROUNDWATER TREATMENT SYSTEM OR DURING THE REMEDIATION OF THE SOILS. ANY POTENTIAL IMPACT ON AIR WILL BE CONSIDERED ALONG WITH THE DESCRIPTION OF EACH INDIVIDUAL REMEDIAL ALTERNATIVE.

A. REMEDIAL ALTERNATIVES TO ADDRESS GROUNDWATER CONTAMINATION

THE FOLLOWING ALTERNATIVES WERE DEVELOPED TO ADDRESS GROUNDWATER CONTAMINATION AT THE SITE. THE THREE GROUNDWATER CONTROL (GWC) REMEDIAL ALTERNATIVES ARE:

GWC-1A: NO ACTION
GWC-1B: LONG-TERM MONITORING OF GROUNDWATER
GWC-2A: RECOVERY AND TREATMENT OF ALL SITE GROUNDWATER EXCEEDING GROUNDWATER REMEDIATION LEVELS USING AIR STRIPPING, COAGULATION/FILTRATION

THE REMEDIAL RESPONSE ACTIONS TO ADDRESS GROUNDWATER CONTAMINATION ARE DISCUSSED BELOW.

GWC-1A: NO ACTION

THE NO ACTION ALTERNATIVE IS INCLUDED, AS REQUIRED BY CERCLA AND THE NCP, TO SERVE AS A BASELINE FOR COMPARISON WITH OTHER GROUNDWATER CONTROL MEASURES. THIS ALTERNATIVE WOULD NOT INVOLVE ANY TREATMENT OR OTHER REMEDIAL ACTIONS. THE DESCRIPTION OF THIS ALTERNATIVE IS INCLUDED IN THE FOLLOWING SECTION.

GWC-1B: LONG-TERM MONITORING OF GROUNDWATER

THIS ALTERNATIVE IS IDENTICAL TO GWC-1A BUT INCLUDES LONG-TERM MONITORING OF SITE GROUNDWATER AND THE PLACEMENT OF DEED RESTRICTIONS TO REDUCE THE POTENTIAL FOR THE CONSTRUCTION OF POTABLE WELLS ON THE PROPERTY.

ALTERNATIVES GWC-1A AND GWC-1B, SITE CONDITIONS WOULD REMAIN UNCHANGED.

SLIGHT REMEDIATION OF CONTAMINATED GROUNDWATER MAY OCCUR THROUGH NATURAL PROCESSES SUCH AS BIODEGRADATION, ADSORPTION, AND ATTENUATION BY UPGRADIENT FLOW. THE LOW CONCENTRATION OF SITE-RELATED CHEMICALS THAT WOULD REMAIN IN THE GROUND WATER HAVE THE POTENTIAL TO DISCHARGE TO SOLOMON CREEK.

IMPLEMENTATION OF ALTERNATIVE GWC-1A COULD BEGIN IMMEDIATELY AND WOULD HAVE NO NEGATIVE IMPACTS OF FUTURE REMEDIAL ACTIONS. OPERATING COSTS WOULD BE INCURRED BECAUSE OF THE MANDATORY REVIEW EVERY FIVE YEARS. IMPLEMENTATION OF ALTERNATIVE GWC-1B MAY BE DELAYED APPROXIMATELY ONE MONTH AS THIS APPROACH MAY INCLUDE THE INSTALLATION OF ADDITIONAL MONITORING WELLS. IN ADDITION, UNDER GWC-1B, DEED RESTRICTIONS WOULD BE PLACED ON THE PROPERTY IN AN ATTEMPT TO LIMIT THE FUTURE USE OF THE GROUNDWATER. CAPITAL COSTS FOR GWC-1B WOULD BE INCURRED FOR MONITORING WELL CONSTRUCTION; OPERATING COSTS WOULD INCLUDE PERIODIC GROUNDWATER SAMPLING, CHEMICAL ANALYSIS, AND REVIEWING AND DOCUMENTING SITE CONDITIONS EVERY FIVE YEARS; MAINTENANCE COSTS WOULD BE INCURRED FOR INSPECTION OF THE MONITORING WELLS.

ESTIMATED PERIOD OF OPERATION: 30 YEARS

ESTIMATED TOTAL COST (NET PRESENT WORTH):
ALTERNATIVE GWC-1 $ 140,000
ALTERNATIVE GWC-2 $1,840,000.

GWC-2A: RECOVERY AND TREATMENT OF ALL SITS GROUNDWATER EXCEEDING GROUNDWATER REMEDIATION LEVELS USING AIR STRIPPING, COAGULATION/FILTRATION

THIS ALTERNATIVE CONSIDERS THE ENTIRE SITE AS THE POINT OF COMPLIANCE; THEREFORE, UNDER THIS ALTERNATIVE ALL GROUNDWATER EXCEEDING REMEDIATION LEVELS WILL BE RECOVERED THROUGH A SYSTEM OF EXTRACTION WELLS AT THE UPPER MACON, LOWER MACON, UPPER DOCKERY, AND LOWER DOCKERY SITES AS PRESENTED IN FIGURES 8 AND 9. THE SITE IS DELINEATED BY THE EXTENT OF CONTAMINATION IN THE GROUNDWATER.

THE TREATMENT SYSTEM FOR THE EXTRACTED GROUNDWATER WOULD INVOLVE INSTALLING PIPING FROM EACH EXTRACTION WELL TO A COMMON TREATMENT AREA, A SPECIFIC TREATMENT SYSTEM, AND DISCHARGING THE TREATED GROUNDWATER. BECAUSE OF THE DISTANCE INVOLVED, SEPARATE TREATMENT FACILITIES WILL BE SPECIFIED FOR THE MACON AND DOCKERY SITES. THE TOTAL EXTRACTED FLOW RATE FOR OPTION GWC-2A IS ESTIMATED TO BE 40 GALLONS PER MINUTE (GPM). THE CONCEPTUAL FLOW DIAGRAM FOR GROUND WATER TREATMENT IS PRESENTED IN FIGURE 10.

AIR STRIPPING IS A MASS TRANSFER PROCESS IN WHICH VOLATILE COMPOUNDS IN A WATER COLUMN ARE TRANSFERRED TO AN AIR STREAM WITHIN A PACKED TOWER. THE AIR STRIPPING TOWER WILL REMOVE THE VOLATILE COMPOUNDS TO BELOW QUANTITATION LIMITS. UNDER "NORTH CAROLINA AIR POLLUTION RULES" (15A NCAC 2D.1104) A PERMIT IS REQUIRED FOR THE EMISSION OF ANY TOXIC VOCS. TOXIC VOCS SHOULD NOT BE EMITTED IN SUCH QUANTITIES THAT THE RESULTING CONCENTRATION AT THE PROPERTY LINE IS ABOVE THE ALLOWABLE CONCENTRATIONS. ALLOWABLE CONCENTRATIONS OF TOXIC VOCS ARE GIVEN IN "NORTH CAROLINA AIR POLLUTION RULES" (15A NCAC 2D.1104). TO SATISFY NORTH CAROLINA REQUIREMENTS, THE IMPACT OF EMISSIONS FROM THE PROPOSED AIR STRIPPER FOR TREATING THE CONTAMINATED GROUND WATER AT THE SITE WAS EVALUATED BY UTILIZING THE EPA SCREEN MODEL (EPA-450/2-78-027R). THE RESULTS OF THE AIR DISPERSION MODEL CONDUCTED TO ESTIMATE THE AIRBORNE CONCENTRATIONS AT THE PROPERTY LINE FOUND THAT THE CONTAMINANT LEVELS WOULD BE BELOW ALLOWABLE STATE LEVELS. EMISSION FROM PROPOSED AIR STRIPPERS, THEREFORE, WILL NOT ADVERSELY IMPACT THE AIR QUALITY OF THE SITE AND ITS SURROUNDINGS.

FILTRATION IS A PHYSICAL PROCESS IN WHICH METALS ARE REMOVED FROM GROUNDWATER BY FORCING THE FLUID THROUGH A POROUS MEDIA. THE METALS ARE TRAPPED OR ENMESHED IN THE MEDIA. FILTRATION HAS BEEN IDENTIFIED TO BE A SUCCESSFUL TREATMENT TECHNOLOGY FOR THE REMOVAL OF METALS.

COAGULATION IS A PHYSICOCHEMICAL PROCESS USED TO AGGLOMERATE COLLOIDAL SUSPENSIONS AND OTHER SMALL PARTICULATE MATTER THAT CANNOT BE REMOVED THROUGH STANDARD FILTRATION. COAGULATION CAN GENERATE SIGNIFICANT VOLUMES OF SLUDGE THAT WOULD REQUIRE SUBSEQUENT TREATMENT AND/OR DISPOSAL. COMMONLY USED COAGULANTS USED FOR METALS REMOVAL INCLUDE LIME FERRIC SULFATE, FERRIC CHLORIDE AND ALUM. COAGULATION IS AN EFFECTIVE TECHNOLOGY FOR THE REMOVAL OF PARTICULATE METALS.

FILTRATION WOULD SIGNIFICANTLY REMOVE METALS. COAGULATION WOULD PROVIDE A FURTHER LEVEL OF TREATMENT IF FILTRATION ALONE COULD NOT ACHIEVE THE REQUIRED DISCHARGE LEVELS FOR METALS. ACTUAL METALS TREATMENT REQUIREMENTS, IF NECESSARY, WILL BE ESTABLISHED DURING REMEDIAL DESIGN.

DISCHARGE OF TREATED GROUNDWATER COULD BE EITHER TO A SURFACE WATER (SOLOMONS CREEK) OR TO AN INFILTRATION GALLERY. SURFACE WATER DISCHARGE WOULD REQUIRE A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT. WITH AN INFILTRATION GALLERY, THE TREATED GROUND WATER IS PUMPED INTO TRENCHES LINED WITH GRAVEL AND ALLOWED TO PERCOLATE INTO THE SOIL. A POSITIVE HYDRAULIC HEAD IS THE DRIVING FORCE BEHIND THE SYSTEM, AS OPPOSED TO AN ACTIVE PUMPING SYSTEM INJECTING THE WATER INTO THE SUBSURFACE. THE SUCCESS OF THIS METHOD IS DEPENDENT ON VADOSE ZONE ACCEPTANCE OF THE TREATED WATER. AN APPROVED METHOD OF PERCOLATION TESTING WOULD BE REQUIRED TO DETERMINE PERMISSIBLE APPLICATION RATES OF TREATED WATER. THE INFILTRATION GALLERY MUST BE LOCATED SO THAT RECHARGE TO THE AQUIFER DOES NOT INTERFERE WITH THE PERFORMANCE OF THE EXTRACTION SYSTEM.

ESTIMATED PERIOD OF OPERATION: 30 YEARS

ESTIMATED TOTAL COST (NET PRESENT WORTH):
ALTERNATIVE GWC-2A $6,900,000

REMOVAL ALTERNATIVE TO ADDRESS SOURCE CONTROL

THE RESPONSE ACTIONS TO ADDRESS SOURCE CONTROL (SC) AT THE MACON/DOCKERY SITE ARE:
SC-1: NO ACTION
SC-2: CAP FORMER LAGOON 7 AND LAGOON 10
SC-3: SOIL VAPOR EXTRACTION (SVE) FOR LAGOON 7, CAP LAGOON 10
SC-4: SVE FOR LAGOON 7, BIOREMEDIATION FOR LAGOON 10
SC-5: SVE FOR LAGOON 7, OFF-SITE DISPOSAL FOR LAGOON 10

BELOW ARE DESCRIPTIONS OF EACH OF THE SOURCE CONTROL/REMEDIATION ALTERNATIVES.

SC-1: NO ACTION

UNDER THE NO ACTION ALTERNATIVE, NO FURTHER REMEDIAL ACTIVITIES WOULD OCCUR. SUBSURFACE SOILS UNDERLYING FORMER LAGOON 7 WOULD CONTINUE TO ACT AS A SOURCE OF CHEMICALS TO GROUNDWATER AND THE TEMPORARY COVER OVER LAGOON 10 WOULD REMAIN IN PLACE AND UNIMPROVED. THIS NO ACTION ALTERNATIVE IS REQUIRED UNDER THE NCP TO SERVE AS A BASELINE FOR COMPARISON. A FIVE YEAR REVIEW OF REMEDY WOULD BE REQUIRED.

THE NO ACTION ALTERNATIVE COULD BE READILY IMPLEMENTED, AND WOULD NOT HINDER ANY FUTURE REMEDIAL ACTIONS. THERE ARE NO CONSTRUCTION COSTS ASSOCIATED WITH THIS ALTERNATIVE. HOWEVER, OPERATION AND MAINTENANCE (O&M) COSTS WOULD INVOLVE REVIEW OF THE REMEDY EVERY FIVE YEARS.

ESTIMATED PERIOD OF OPERATION:	30 YEARS
TOTAL CONSTRUCTION COSTS:	$0
ESTIMATED PRESENT WORTH O&M COSTS:	$190.000
ESTIMATED TOTAL COSTS (NET PRESENT WORTH):	$190,000

SC-2: CAP FORMER LAGOON 7 AND LAGOON 10

THIS ALTERNATIVE INVOLVES CONSTRUCTION AND OPERATION OF TWO LOW PERMEABILITY CAPS OVER LAGOON 7 AND LAGOON 10, AS SHOWN IN FIGURE 11 AND 12. THE AREAL EXTENT OF THE CAP FOR LAGOON 7 AND LAGOON 10 WOULD BE APPROXIMATELY 7,500 SQUARE FEET AND 13,000 SQUARE FEET, RESPECTIVELY.

THE CAP OVER LAGOON 7 WOULD ADDRESS THE POTENTIAL FOR RESIDUAL SOIL CONCENTRATIONS OF PCE TO IMPACT GROUND WATER ABOVE REMEDIATION LEVELS. THE EXISTING CAP OVER LAGOON 10 WOULD BE REPLACED WITH A PERMANENT DESIGN AS A PREVENTIVE MAINTENANCE MEASURE TO ALLOW BETTER LONG-TERM CONTROL OF WASTE RESIDUALS.

CAPPING IS THE COVERING OF CONTAMINATED WASTES OR SOILS. IN THIS APPROACH, A LAYER OF COMPACTED SOIL WOULD BE USED TO COVER THE AREA; THIS LAYER WOULD BE COVERED WITH AN IMPERMEABLE SYNTHETIC LINER TO PREVENT WIND, RAIN, AND MELTING SNOW FROM CARRYING CONTAMINANTS BEYOND THEIR PRIMARY LOCATION. THIS APPROACH WOULD ALSO PREVENT DIRECT HUMAN AND ANIMAL CONTACT WITH CONTAMINANTS. THE FINISH CAP WOULD BE COVERED WITH SOIL AND SEEDED FOR EROSION CONTROL AND TO MAKE IT BLEND INTO THE LANDSCAPE. MAINTENANCE IS MINIMAL, REQUIRING PERIODIC INSPECTIONS AND THE FILLING OF CRACKS OR DEPRESSIONS, IF THEY APPEAR.

CONSTRUCTION OF A CAP WOULD INVOLVE HEAVY EARTH MOVING AND GRADING EQUIPMENT AND THE CLEARING OIL VEGETATION. EXISTING SITE ACCESS WORLD PROBABLY HAVE TO BE IMPROVED. DUST CONTROL MEASURES WOULD BE TAKEN TO MINIMIZE SHORT TERM POTENTIAL RELEASE OF AIRBORNE PARTICULATES. IN THE IMPLEMENTATION OF THIS OPTION, GROUNDWATER OBSERVATION WELLS NOT REQUIRED FOR LONG-TERM MONITORING WOULD BE ABANDONED. DRAINAGE SWALES AND A SECURITY FENCE WOULD BE CONSTRUCTED ALONG THE CAP PERIMETER. DEED RESTRICTIONS WOULD BE INCLUDED IN THE IMPLEMENTATION OF THIS ALTERNATIVE IN ORDER TO CONTROL FUTURE USE OF THE SITE.

THERE ARE NO ARARS FOR CAPPING AT THE SITE, AND RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) DISPOSAL REQUIREMENTS ARE NOT APPLICABLE; HOWEVER, THE SINGLE SYNTHETIC LINER CAP DESIGN WOULD MEET AN EQUIVALENT STANDARD OF PERFORMANCE TO RCRA REQUIREMENTS.

LONG-TERM EFFECTIVENESS AND PERMANENCE OF THIS APPROACH WOULD RELY ON REGULAR INSPECTIONS TO ENSURE THE RELIABILITY OF THE CAP; AN INSPECTION AND MAINTENANCE SCHEDULE WOULD BE IMPLEMENTED FOLLOWING CONSTRUCTION AND CONTINUE AS LONG AS CHEMICAL RESIDUALS REMAINED AT THE SITE. EVALUATION OF CAP EFFECTIVENESS WOULD BE PERFORMED THROUGH PERIODIC GROUNDWATER MONITORING. IF DEEMED NECESSARY DURING THE DESIGN PHASE, GAS VENTS WILL BE INCORPORATED INTO THE CAP. BECAUSE RESIDUALS WOULD REMAIN AT THE SITE, CERCLA SECTION 121(C) REQUIRES A REVIEW OF EFFECTIVENESS AND PROTECTIVENESS BE MADE, EVERY FIVE YEARS.

OPERATING COST WOULD BE INCURRED TO MAINTAIN THE CAP AND TO DEVELOP REPORTS AND REVIEWS OF THE SITE REMEDY EVERY FIVE YEARS. BIANNUAL SAMPLING WOULD BE CONDUCTED UNDER THIS ALTERNATIVE.

ESTIMATED PERIOD OF OPERATION:	30 YEARS
ESTIMATED TOTAL CONSTRUCTION COSTS:	$430,000
ESTIMATED PRESENT WORTH O&M COSTS:	$260.000
ESTIMATED TOTAL COST (NET PRESENT WORTH):	$690,000

SC-3 SOIL VAPOR EXTRACTION (SVE) FOR LAGOON 7, CAP LAGOON 10

THIS ALTERNATIVE INVOLVES THE CONSTRUCTION AND OPERATION OF A REPLACEMENT CAP OVER LAGOON 10 AND A SOIL VAPOR EXTRACTION (SVE) SYSTEM AT FORMER LAGOON 7. CAPPING IS PRESENTED UNDER ALTERNATIVE SC-2. THE ANALYSIS HERE WILL FOCUS ON ADDITIONAL CONSIDERATIONS ASSOCIATED WITH APPLICATION OF SVE.

SVE WOULD BE APPLIED TO FORMER LAGOON 7 FOR THE REMOVAL OF TETRACHLOROETHENE (PCE). BASED ON THE VIP MODELING, PCE IS THE ONLY COMPOUND IN SITE SOILS WITH THE POTENTIAL TO CAUSE GROUND WATER TO EXCEED GROUNDWATER REMEDIATION LEVELS. ALSO BASED ON THE VIP MODELING, TARGET REMEDIATION LEVELS FOR SVE AT THE SITE WOULD BE 3000 UG/KG PCE IN THE VADOSE ZONE BENEATH FORMER LAGOON 7.

SVE TYPICALLY INCLUDES A SERIES OF SLOTTED VERTICAL INJECTION VENTS CONNECTED BY A COMMON MANIFOLD TO AN EXTRACTION PUMP OR BLOWER. VOLATILE COMPOUNDS AND SOME SVOC'S ARE WITHDRAWN THROUGH AN INDUCED PRESSURE GRADIENT IN THE SUBSURFACE. AIR EMISSIONS FROM THE SVE SYSTEM MAY REQUIRE TREATMENT, SUCH AS BEING SCRUBBED OR SENT THROUGH AN ACTIVATED CARBON FILTER, PRIOR TO BEING VENTED TO THE ATMOSPHERE. THE NEED FOR EMISSION CONTROL WOULD BE DETERMINED DURING THE DESIGN. UPON COMPLETION OF SVE ACTIVITIES, THERE WOULD NO LONGER BE A SIGNIFICANT SOURCE OF CHEMICALS TO IMPACT GROUNDWATER QUALITY ABOVE THE IDENTIFIED ARARS. THE EFFECTIVENESS OF SVE IN THE REMOVAL OF PCE FROM SITE SOILS WOULD BE EVALUATED THROUGH PERIODIC SAMPLING OF THE AIR EMISSIONS. SOIL BORINGS WOULD BE REQUIRED TO CONFIRM THAT THE TETRACHLOROETHENE REMEDIATION

LEVELS HAD BEEN ACHIEVED.

ESTIMATED PERIOD OF OPERATION: 1 YEAR (SVE); 30 YEARS (CAP)
ESTIMATED TOTAL CONSTRUCTION COSTS: $630,000
ESTIMATED PRESENT WORTH O&M COSTS: $370,000
ESTIMATED TOTAL COST (NET PRESENT WORTH): $1,000,000

SC-4 SVE FOR LAGOON 7; BIOREMEDIATION FOR LAGOON 10

THIS ALTERNATIVE INVOLVES THE OPERATION OF A SVE SYSTEM AT FORMER LAGOON 7 AND BIOLOGICAL TREATMENT OF LAGOON 10 WASTES IN A CONTROLLED CELL. A DESCRIPTION OF THE SVE SYSTEM IS PRESENTED IN ALTERNATIVE SC-3. DEED RESTRICTIONS COULD PROVIDE AN ADDED MEASURE OF SAFETY BY ALERTING POTENTIAL PROPERTY BUYERS OF RESIDUAL CONTAMINATION OR BY RESTRICTING USAGE OF THE PROPERTY.

BIOLOGICAL TREATMENT WOULD BE APPLIED TO LAGOON 10 (FIGURE 11). LAGOON 10 CONTAINS VARIOUS ORGANIC WASTES, INCLUDING 950 TONS OF CREOSOTE AND SOLIDIFIED SLUDGE COLLECTED DURING EPA'S IMMEDIATE REMOVAL ACTION.

BIODEGRADATION OF THESE COMPOUNDS HAS BEEN DEMONSTRATED UNDER A VARIETY OF ENVIRONMENTAL CONDITIONS AND SOIL TYPES. PREVIOUS STUDIES HAVE REPORTED 80 TO 90 PERCENT REMOVAL OF THESE COMPOUNDS IN LESS THAN FOUR MONTHS OF TREATMENT. THIS TECHNOLOGY IS PROPOSED IN CONJUNCTION WITH SVE AS AN INNOVATIVE ALTERNATIVE BY WHICH LAGOON 10 WASTES MAY BE PERMANENTLY DESTROYED. INSTALLATION OF THE SVE SYSTEM AT LAGOON 7 MAY PROCEED CONCURRENTLY WITH BIOLOGICAL TREATMENT OF THE LAGOON 10 SOILS.

SPECIFIC REMEDIAL OBJECTIVES WOULD BE ESTABLISHED AFTER EVALUATION OF A TREATABILITY STUDY. TREATMENT LEVELS THAT COULD BE ACHIEVED FOR THE LAGOON 10 CHEMICAL RESIDUALS WOULD BE DETERMINED. AS DISCUSSED, THESE RESIDUALS ARE NOT EXPECTED TO IMPACT GROUND WATER. ANY RISKS POSED BY THE TREATMENT RESIDUALS WOULD BE THROUGH INCIDENTAL HUMAN EXPOSURE. RISK ASSESSMENT GUIDELINES WOULD BE USED TO ESTABLISH PROTECTIVE LEVELS OF HUMAN HEALTH. SHOULD THE FINAL TREATMENT LEVELS BE WITHIN THE RISK-BASED LEVELS, THE TREATED MATERIALS WOULD BE REPLACED DIRECTLY IN THE LAGOON. IF THE TREATMENT LEVELS EXCEED THE RISK-BASED LEVELS, A LOW PERMEABILITY CAP AS DESCRIBED FOR ALTERNATIVE SC-2 WOULD BE PLACED OVER THE TREATED MATERIALS TO DENY INCIDENTAL HUMAN EXPOSURE.

RCRA LAND DISPOSAL RESTRICTIONS (LDR) ARE POTENTIAL ARARS IF THE LAGOON 10 MATERIALS ARE DETERMINED TO BE A CHARACTERISTIC OR LISTED HAZARDOUS WASTE. COMPOUNDS WITHIN LAGOON 10 ARE NOT AMONG THE CHARACTERISTIC WASTE COMPOUNDS OF THE TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP; 55 FR 11798) THAT ESTABLISHES CHARACTERISTIC HAZARDOUS WASTES. LAGOON 10 MATERIALS THEREFORE CANNOT BE A CHARACTERISTIC WASTE. TO BE CLASSIFIED AS LISTED HAZARDOUS WASTE UNDER RCRA, THE FOLLOWING INFORMATION MUST BE ASCERTAINED: THE EXACT IDENTIFICATION OF THE ORIGINAL WASTE STREAM, WHETHER OR NOT THE MATERIAL WAS OFF-SPECIFICATION OR PAST SHELF LIFE, AND THE MATERIAL MUST CONTAIN A CHEMICAL LISTED IN 40 CFR 261.33 AS THE SOLE ACTIVE INGREDIENT. THE INFORMATION COLLECTED THUS FAR IN THE RI/FS IS INSUFFICIENT TO MAKE THESE DETERMINATION, AND THEREFORE THE MATERIAL IN LAGOON 10 CANNOT BE CLASSIFIED AS LISTED HAZARDOUS WASTE UNDER RCRA. RCRA LDR ARE THEREFORE NOT ARAR FOR THE TREATMENT OR DISPOSAL OF LAGOON 10 MATERIALS.

LAGOON 10 WASTES WOULD BE EXCAVATED AND TRANSFERRED TO A LINED WASTE TREATMENT CELL WHERE BIOREMEDIATION WOULD BE CONDUCTED AND MONITORED. THE TREATMENT CELL WOULD BE ENCLOSED WITHIN A GREENHOUSE-TYPE STRUCTURE THAT WOULD SERVE TO MAINTAIN OPTIMUM MICROBIAL GROWTH CONDITIONS AND TO CONTROL ANY AIR EMISSIONS. VAPOR PHASE CARBON ADSORPTION WOULD BE USED, AS NECESSARY, TO CONTROL EMISSION CONCENTRATIONS FROM THE GREENHOUSE. TREATMENT DESIGN AND OPERATION WOULD BE ESTABLISHED DURING REMEDIAL DESIGN.

TREATED WASTES WOULD BE RETURNED TO LAGOON 10 UPON REACHING THE TARGETED REMEDIATION LEVEL. THE AREA CONTAINING THE TREATED WASTE WILL BE COVERED WITH CLEAN SOIL, GRADED AND REVEGETATED. ACTUAL CLOSURE REQUIREMENTS WOULD BE ESTABLISHED DURING REMEDIAL DESIGN.

ESTIMATED PERIOD OF OPERATION:1 YEAR (SVE);
25-31 MONTHS (BIOREMEDIATION)
ESTIMATED TOTAL CONSTRUCTION COSTS: $1,300,000
ESTIMATED PRESENT WORTH O&M COST: $ 200,000

ESTIMATED TOTAL COST
(NET PRESENT WORTH): $1,500,000

SC-5: SVE FOR LAGOON 7, OFF-SITS DISPOSAL FOR LAGOON 10

THIS ALTERNATIVE INVOLVES THE CONSTRUCTION AND OPERATION OF A SOIL VAPOR EXTRACTION SYSTEM AT FORMER LAGOON 7 AND EXCAVATION OF LAGOON 10 WASTES FOR DISPOSAL AT A HAZARDOUS WASTE LANDFILL. DETAILED ANALYSIS OF SOIL VAPOR EXTRACTION AT LAGOON 7 IS PRESENTED IN ALTERNATIVE SC-3. OFF-SITE DISPOSAL OF LAGOON 10 WASTES WOULD SIGNIFICANTLY REDUCE THE VOLUME OF WASTE MATERIALS AND PROVIDE A MORE COMPREHENSIVE RESTORATION OF THE SITE.

OFF-SITE LANDFILLING OF LAGOON 10 MATERIALS WOULD HAVE TO CONFORM TO RCRA LAND DISPOSAL RESTRICTION (LDR; 40 CFR 268) IF THE MATERIALS WERE DETERMINED TO BE HAZARDOUS. THE MATERIALS IN LAGOON 10 COME FROM A NUMBER OF UNKNOWN, DISPARATE SOURCES THAT CANNOT BE IDENTIFIED WITH ANY CERTAINTY. THESE MATERIALS WOULD THEREFORE BE CLASSIFIED AS SOIL AND DEBRIS POTENTIALLY CONTAINING HAZARDOUS WASTE UNDER THE LDR EPA'S OFFICE OF SOLID AND HAZARDOUS WASTE HAS POSTPONED FINAL STANDARDS FOR SOILS AND DEBRIS UNTIL MAY OF 1992. UNTIL THEN, LANDFILL OF SOILS AND DEBRIS WOULD BE BASED ON WHETHER THE MATERIALS WERE CONSIDERED UNDER TCLP ANALYSIS. SHOULD THE MATERIALS EXCEED TCLP REGULATORY LEVELS, THEY WOULD BE DISPOSED IN A HAZARDOUS CELL AT RCRA-APPROVED FACILITY. OTHERWISE, THE LAGOON 10 SOILS COULD BE PLACED IN A NON-HAZARDOUS CELL AT THE FACILITY.

REMOVAL OF THE WASTE MATERIALS WOULD FIRST INVOLVE REMOVAL OF THE SYNTHETIC LINER AND THE OVERLYING CLAY COVER. THE WASTE MATERIALS WOULD THEN BE EXCAVATED TO NATIVE SOILS, A DEPTH OF APPROXIMATELY 10 FEET. THE VOLUME OF WASTE MATERIALS IS ESTIMATED TO BE APPROXIMATELY 1,000 CUBIC YARDS. EXCAVATED SOILS WOULD BE PLACED INTO LINED ROLL-OFF BOXES AND THEN COVERED WITH A TARP. DUST CONTROLS, AND AMBIENT AIR MONITORING WOULD BE CONDUCTED TO MINIMIZE ANY AIR EMISSION ACTS. FOLLOWING REMOVAL OF ALL WASTE MATERIALS, THE EXCAVATION WOULD BE BACKFILLED WITH NATIVE SOILS AND COVERED WITH COMPACTED CLAY REMAINING FROM THE CAP.

IF THE LAGOON 10 MATERIALS ARE HAZARDOUS, THEY WOULD BE MANIFESTED PER RCRA REQUIREMENTS AND HAULED BY A REGISTERED HAZARDOUS WASTE TRANSPORTER. TRUCKS WOULD BE WASHED DOWN PRIOR TO LEAVING THE SITE.

THE ACTUAL DISPOSAL REQUIREMENTS AND RCRA-APPROVED FACILITY WOULD BE DETERMINED DURING REMEDIAL DESIGN.

ESTIMATED PERIOD OF OPERATION: 1 YEAR (SVE); 1 MONTH (DISPOSAL)

	CLASSIFICATION	
	HAZARDOUS	NON-HAZARDOUS
ESTIMATED TOTAL CONSTRUCTION COSTS:	$660,000	$410,000
ESTIMATED PRESENT WORTH O&M COSTS:	$110,000	$110,000
ESTIMATED TOTAL COST (NET PRESENT WORTH):	$770,000	$520,000

C. REMEDIAL ALTERNATIVES TO ADDRESS VESSELS

THERE ARE 8 VATS, 2 TANKERS, AND 14 TANKS AT THE MACON/DOCKERY SITE. THE CONTENTS OF THE SITE VESSELS ARE SUMMARIZED IN TABLE 55. ALSO ON SITE IS A BOX TRAILER CONTAINING FERTILIZER AND A BOILER WHICH MAY HAVE ASBESTOS INSULATION. FOLLOWING IS A DISCUSSION OF ALTERNATIVES V-1 (NO ACTION) AND V-2 (OFF-SITE DISPOSAL).

V-1: NO ACTION

VESSELS WOULD BE LEFT IN PLACE UNDER THIS ALTERNATIVE. SINCE THE VESSELS AND THEIR CONTENTS WOULD NOT BE ADDRESSED UNDER THIS ALTERNATIVE, ANY POTENTIAL RISKS WOULD REMAIN. THERE WOULD BE NO REDUCTION IN TOXICITY OR MOBILITY OF THE VESSEL CONTENTS. THE VOLUME OF WASTES IN THE VESSELS MAY FLUCTUATE SOME DEPENDING ON RAINWATER INFLUX AND EVAPORATION OF OIL AND WATER. PERIODIC INSPECTIONS WOULD BE REQUIRED TO EVALUATE CONTAINMENT OF THE VESSEL RESIDUALS. A FIVE-YEAR REVIEW OF THIS REMEDY WOULD BE REQUIRED SINCE WASTE MATERIALS WOULD REMAIN AT THE SITE.

CHEMICAL RESIDUALS WITHIN SITE VESSELS ARE CONTAINED AND REPRESENT AN ACCIDENTAL EXPOSURE RISK RATHER THAN AN INCIDENTAL EXPOSURE RISK. VESSELS WERE THEREFORE NOT CONSIDERED IN THE BASELINE RISK ASSESSMENTS. THE VESSELS REPRESENT A POTENTIAL SAFETY HAZARD. THIS ALTERNATIVE WOULD NOT ELIMINATE POTENTIAL RISKS FROM ACCIDENTAL SPILLS OF THE VESSEL CONTENTS OR FROM PHYSICAL INJURY FROM CLIMBING ON THE VESSELS.

NO ACTION WOULD POSE NO ADDITIONAL SHORT TERM RISKS TO THE COMMUNITY OR THE ENVIRONMENT DURING IMPLEMENTATION. HOWEVER, AS THE INTEGRITY OF THE VESSELS DEGRADE, THE POTENTIAL FOR THE RELEASE OF THE CONTENTS OF THE VESSELS INCREASE. NO ACTION CAN BE IMPLEMENTED IMMEDIATELY.

THERE ARE NO CONSTRUCTION COSTS FOR THIS ALTERNATIVE. OPERATING COSTS WOULD CONSIST OF AN ANNUAL INSPECTION AND REVIEW OF REMEDY EVERY FIVE YEARS.

ESTIMATED TOTAL CONSTRUCTION COSTS:	$ 0
ESTIMATED PRESENT WORTH O&M COSTS:	$90.000
ESTIMATED TOTAL COST (NET PRESENT WORTH):	$90,000

V-2: OFF-SITE DISPOSAL

ALTERNATIVE V-2 WOULD INVOLVE TRANSFERRING ALL VESSEL CONTENTS INTO SECURE TRANSPORTATION VEHICLES AND DISMANTLING THE VESSELS. SOME OR ALL OF THE BUILDINGS MAY NEED TO BE DEMOLISHED AND REMOVED DURING REMEDIATION OF THE SITE. HAZARDOUS VESSEL CONTENTS WOULD BE TAKEN TO A RCRA-APPROVED FACILITY FOR DISPOSAL. NON-HAZARDOUS VESSEL CONTENTS AND THE VESSEL PIECES WOULD BE RECYCLED OR SENT TO AN INDUSTRIAL LANDFILL FOR DISPOSAL.

CONTENTS OF THE SITE VESSELS ARE CHARACTERIZED IN TABLE 38 AND ARE SUMMARIZED IN TABLE 55. HAZARDOUS SOLIDS WOULD BE DRUMMED AND TAKEN TO A RCRA-APPROVED LANDFILL FOR DISPOSAL WHILE THE REMAINING SOLIDS (INCLUDING TAR) WOULD BE DISPOSED AS NON-HAZARDOUS WASTE. WATER WOULD BE SENT THROUGH THE GROUND WATER TREATMENT SYSTEM, OR TAKEN TO THE LOCAL PUBLICLY OWNED TREATMENT WORKS FOR DISPOSAL, PENDING COMPARISON WITH PRETREATMENT REQUIREMENTS. OIL WOULD BE PUMPED INTO TANKER TRUCKS FOR OF SITE RECLAMATION OR INCINERATION. ULTIMATE DISPOSITION OF THE OILS WOULD BE BASED ON THE BULK CONCENTRATIONS IN THE TANKER THAT WOULD BE SENT TO THE RECEIVING FACILITY.

FERTILIZER IN THE BOX TRAILER AND THE BOILER INSULATION WOULD BE DISPOSED OF AS NON-HAZARDOUS WASTE OR RECYCLED. BOILER INSULATION HAS NOT BEEN CHARACTERIZED BUT, BASED ON THE ASSUMED AGE OF CONSTRUCTION, MAY CONTAIN ASBESTOS. CHARACTERIZATION OF THE INSULATION WOULD BE REQUIRED PRIOR TO DISMANTLING THE BOILER. TO BE CONSERVATIVE, IT IS ASSUMED THAT DISPOSAL OF BOILER INSULATION WOULD HAVE TO COMPLY WITH ASBESTOS HANDLING REQUIREMENTS.

POTENTIAL RISKS FROM THE VESSELS WOULD BE ACCIDENTAL AND WERE NOT ADDRESSED IN THE BASELINE RISK ASSESSMENTS. THIS ALTERNATIVE WOULD ELIMINATE POTENTIAL RISKS FROM ACCIDENTAL SPILLS OF THE VESSEL CONTENTS OR FROM PHYSICAL INJURY FROM CLIMBING ON THE VESSELS.

RCRA REGULATION WERE IDENTIFIED AS POTENTIALLY RELEVANT AND APPROPRIATE ARARS FOR VESSEL REMEDIATION. RCRA DISPOSAL GUIDANCE WAS IDENTIFIED AS AN ACTION-SPECIFIC ARAR WHILE RCRA HAZARD CHARACTERISTICS WERE IDENTIFIED AS A CHEMICAL-SPECIFIC ARAR (I.E., TCLP).

IT IS NOT KNOWN IF THE INDUSTRIAL BOILER (BUILDING 2, FIGURE 1) CONTAINS FRIABLE ASBESTOS. IF THIS BOILER DOES CONTAIN ASBESTOS, THREE POTENTIAL ACTION-SPECIFIC ARARS MAY APPLY FOR OF OFFSITE DISPOSAL: (1) 29 CFR PARTS 1910.1001 AND 1926.58 (GENERAL ASBESTOS REGULATIONS UNDER THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND CONSTRUCTION/DEMOLITION REGULATIONS, RESPECTIVELY), (2) NORTH CAROLINA SPECIFICATIONS FOR ASBESTOS ABATEMENT (DIVISION OF STATE CONSTRUCTION, DEPARTMENT OF ADMINISTRATION, AS AMENDED IN FEBRUARY 1988) AND (3) 40 CFR PART 61 (CAA) EPA NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP). MOST OF THESE REGULATIONS PERTAIN TO THE PACKING AND SHIPPING OF ASBESTOS-CONTAINING MATERIALS SUCH THAT THE AMOUNT OF ASBESTOS FIBERS ENTERING THE AIR AND AFFECTING POTENTIAL HUMAN EXPOSURE ARE MINIMIZED. ALTERNATIVE V-2 WOULD FOLLOW THE OSHA, NORTH CAROLINA AND EPA REQUIREMENTS AND THEREFORE WOULD COMPLY WITH THESE POTENTIAL ARARS.

SINCE THE VESSELS AND THEIR CONTENTS WOULD BE TAKEN OFF-SITE AND RECYCLED OR DISPOSED, THERE WOULD BE NO RESIDUAL RISK FOLLOWING IMPLEMENTATION OF ALTERNATIVE V-2. SINCE THE TANKERS CONTAIN SOLIDS OR TAR THAT ARE NOT HAZARDOUS ACCORDING TO RCRA TOXICITY CHARACTERISTICS, AND WOULD BE DIFFICULT TO CLEAN BECAUSE OF THE TAR AND SOLIDS RESIDUES, OFF-SITE BURIAL AT AN

INDUSTRIAL LANDFILL (NON-HAZARDOUS) WOULD BE FEASIBLE.

THE VOLUME AND TOXICITY OF MATERIALS AT THE SITE WOULD BE PERMANENTLY REDUCED UNDER THIS ALTERNATIVE. INCINERATION (HAZARDOUS MATERIALS) OR RECYCLING (NON-HAZARDOUS) WOULD EFFECT A PERMANENT REDUCTION IN THE ABSOLUTE VOLUME OF VESSEL CONTENTS.

VESSEL REMOVAL IS ESTIMATED TO TAKE 2 MONTHS. SHORT TERM RISKS INVOLVED IN THIS ALTERNATIVE WOULD BE FROM CUTTING TO DISMANTLE THE VESSELS AND IN MOVING THE SITE VESSELS. OTHER RISKS COULD RESORT FROM THE REMOVAL OF THE SOLIDS FROM VAT 4 BECAUSE OF THE DUST THAT COULD BE GENERATED, AND FROM REMOVAL OF THE BOILER IF IT IS FOUND TO CONTAIN FRIABLE ASBESTOS. HOWEVER, THE LOW AMOUNT OF LEAD AND THE SMALL VOLUME OF SOLID, IN VAT 4 WOULD MINIMIZE ANY EFFECTS FROM THE DUST. DUST CONTROL AND AMBIENT AIR MONITORING WOULD BE CONDUCTED TO MINIMIZE POTENTIAL RISKS TO THE COMMUNITY. POTENTIAL WORKER EXPOSURE WOULD BE REDUCED BY USING THE APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT, AS DIRECTED BY THE REMEDIAL HEALTH AND SAFETY PLAN.

CLEANING AND REMOVAL OF WASTE STORAGE TANKS HAS BEEN SUCCESSFULLY ACCOMPLISHED AT NUMEROUS HAZARDOUS WASTE SITES AND THERE ARE NO SPECIAL REQUIREMENTS AT THIS SITE THAT WOULD LEAD TO IMPLEMENTATION CONCERNS. TRANSFERRING THE VESSEL CONTENTS AND DISMANTLING THE VESSELS WOULD BE READILY IMPLEMENTED.

IF FOUND TO CONTAIN ASBESTOS, THE BOILER WOULD MOST LIKELY BE DISPOSED IN AN INDUSTRIAL WASTE CELL AT A MUNICIPAL LANDFILL. ASBESTOS IS NOT CONSIDERED A HAZARDOUS WASTE.

COSTS ASSOCIATED ALTERNATIVE V-2 WOULD BE DIRECT AND INDIRECT CONSTRUCTION COSTS. THERE WOULD BE NO OPERATIONAL COSTS.

ESTIMATED TOTAL CONSTRUCTION COSTS:	$300,000
ESTIMATED PRESENT WORTH O&M COSTS:	$ 0
ESTIMATED TOTAL COST (NET PRESENT WORTH):	$300,000

9. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

THE THREE POTENTIAL REMEDIAL ALTERNATIVES TO ADDRESS GROUNDWATER CONTROL, FIVE POTENTIAL REMEDIAL ALTERNATIVES TO ADDRESS SOURCE CONTROL, AND TWO ALTERNATIVES TO ADDRESS VESSELS WERE EVALUATED USING THE NINE EVALUATION CRITERIA AS SET FORTH IN THE NCP 40 CFR. S 300.430 (E)(9). A BRIEF DESCRIPTION OF EACH OF THE NINE EVALUATION CRITERIA IS PROVIDED BELOW.

THRESHOLD CRITERIA

1. OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT ADDRESSES HOW A ALTERNATIVE AS A WHOLE WILL PROTECT HUMAN HEALTH AND THE ENVIRONMENT. THIS INCLUDES AN ASSESSMENT OF HOW THE PUBLIC HEALTH AND ENVIRONMENT RISKS ARE PROPERLY ELIMINATED, REDUCED, OR CONTROLLED THROUGH TREATMENT, ENGINEERING CONTROLS, OR CONTROLS PLACED ON THE PROPERTY TO RESTRICT ACCESS AND (FUTURE) DEVELOPMENT. DEED RESTRICTION ARE EXAMPLES OF CONTROLS TO RESTRICT DEVELOPMENT.

2. COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) ADDRESSES WHETHER OR NOT A REMEDY COMPLIES WITH ALL STATE AND FEDERAL ENVIRONMENTAL AND PUBLIC HEALTH LAWS AND REQUIREMENTS THAT APPLY OR ARE RELEVANT AND APPROPRIATE TO THE CONDITIONS AND CLEANUP OPTIONS AT A SPECIFIC SITE. IF AN ARAR CANNOT BE MET, THE ANALYSIS OF THE ALTERNATIVE MUST PROVIDE THE GROUNDS FOR INVOKING A STATUTORY WAIVER.

PRIMARY BALANCING CRITERIA

3. LONG-TERM EFFECTIVENESS AND PERMANENCE REFERS TO THE ABILITY OF AN ALTERNATIVE TO MAINTAIN RELIABLE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT OVER TIME ONCE THE CLEANUP GOALS HAVE BEEN MET.

4. REDUCTION OF TOXICITY, MOBILITY, OR VOLUME ARE THE THREE PRINCIPAL MEASURES OF THE OVERALL PERFORMANCE OF AN ALTERNATIVE. THE 1986 AMENDMENTS TO THE SUPERFUND STATUTE EMPHASIZE THAT, WHENEVER POSSIBLE, EPA SHOULD SELECT A REMEDY THAT USES A TREATMENT PROCESS TO PERMANENTLY REDUCE THE LEVEL OF TOXICITY OF CONTAMINANTS AT THE SITES; THE SPREAD OF CONTAMINANTS AWAY FROM THE SOURCE OF CONTAMINANTS; AND THE VOLUME, OR AMOUNT, OF CONTAMINATION AT THE SITE.

5. SHORT-TERM EFFECTIVENESS REFERS TO THE LIKELIHOOD OF ADVERSE IMPACTS ON HUMAN HEALTH OR THE ENVIRONMENT THAT MAY BE POSED DURING THE CONSTRUCTION AND IMPLEMENTATION OF AN ALTERNATIVE UNTIL CLEANUP GOALS ARE ACHIEVED.

6. IMPLEMENTABILITY REFERS TO THE TECHNICAL AND ADMINISTRATIVE FEASIBILITY OF AN ALTERNATIVE, INCLUDING THE AVAILABILITY OF MATERIALS AND SERVICE NEEDED TO IMPLEMENT THE ALTERNATIVE.

7. COST INCLUDES THE CAPITAL (UP-FRONT) COST OF IMPLEMENTING AN ALTERNATIVE, AS WELL AS THE COST OF OPERATING AND MAINTAINING THE ALTERNATIVE OVER THE LONG TERM, AND THE NET PRESENT WORTH OF BOTH THE CAPITAL AND OPERATION AND MAINTENANCE COSTS.

MODIFYING CRITERIA

8. STATE ACCEPTANCE ADDRESSES WHETHER, BASED ON ITS REVIEW OF THE RI/FS AND PROPOSED PLAN, THE STATE CONCURS WITH, OPPOSES, OR HAS NO COMMENTS ON THE ALTERNATIVE EPA IS PROPOSING AS THE REMEDY FOR THE SITES.

9.COMMUNITY ACCEPTANCE ADDRESSES WHETHER THE PUBLIC CONCURS WITH EPA'S PROPOSED PLAN. COMMUNITY ACCEPTANCE OF THIS PROPOSED PLAN WILL BE EVALUATED BASED ON COMMENTS RECEIVED AT THE PUBLIC MEETINGS AND DURING THE PUBLIC COMMENT PERIOD.

THESE EVALUATION CRITERIA RELATE DIRECTLY TO REQUIREMENTS IN SECTION 121 OF CERCLA, 42 USC SECTION 9621, WHICH DETERMINE THE OVERALL FEASIBILITY AND ACCEPTABILITY OF THE REMEDY. THRESHOLD CRITERIA MUST BE SATISFIED IN ORDER FOR A REMEDY TO BE ELIGIBLE FOR SELECTION. PRIMARY BALANCING CRITERIA ARE USED TO WEIGH MAJOR TRADE-OFFS BETWEEN REMEDIES. STATE AND COMMUNITY ACCEPTANCE ARE MODIFYING CRITERIA FORMALLY TAKEN INTO ACCOUNT AFTER PUBLIC COMMENT IS RECEIVED ON THE PROPOSED PLAN. THE EVALUATION OF THE THREE POTENTIAL REMEDIAL ALTERNATIVES TO ADDRESS GROUNDWATER CONTROL, FIVE POTENTIAL REMEDIAL ALTERNATIVES TO ADDRESS SOURCE CONTROL, AND TWO ALTERNATIVES TO ADDRESS VESSELS WERE DEVELOPED AS FOLLOWS (TABLE 56).

A. THE FOLLOWING ALTERNATIVES WERE SUBJECTED TO DETAILED ANALYSIS FOR MIGRATION CONTROL:

GWC-1A: NO ACTION
GWC-1B: LONG-TERM MONITORING OF GROUNDWATER
GWC-2A: RECOVERY AND TREATMENT OF ALL SITE GROUNDWATER EXCEEDING GROUNDWATER REMEDIAL LEVELS USING AIR STRIPPING, COAGULATION/FILTRATION

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

THE NO ACTION AND LONG-TERM MONITORING OF GROUNDWATER ALTERNATIVES WOULD BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT UNDER CURRENT CONDITION. IN THE FUTURE, GROUND WATER MIGRATION WILL NOT POSE A RISK TO THE ENVIRONMENT, BUT COULD POSE A RISK TO HUMAN HEALTH IF A POTABLE WELL WERE TO BE INSTALLED AT THE SITE. CURRENTLY THERE ARE NO GROUND WATER RECEPTORS AT THE SITE OR IMMEDIATELY DOWNGRADIENT OF THE PROPERTY, AND FUTURE RECEPTORS ARE UNLIKELY. CONSEQUENTLY, THE RISK ESTIMATE FOR THE SITE IS AN ESTIMATE OF POTENTIAL FUTURE RISK OF HUMAN HEALTH.

ALTERNATIVE GWC-2A WOULD BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, NOW AND IN THE FUTURE, SINCE THIS TREATMENT ALTERNATIVE WOULD RESULT IN MCLS BEING ACHIEVED AT ALL TIMES AT POTENTIAL EXPOSURE POINTS.

COMPLIANCE WITH A ARARS

CONCENTRATIONS OF VOCS IN GROUND WATER LOCATED BENEATH THE SITE EXCEED GROUNDWATER REMEDIATION LEVELS, CONSEQUENTLY THE NO ACTION ALTERNATIVE (GWC-1A) AND LONG-TERM MONITORING OF GROUNDWATER (GWC-1B) WOULD NOT SATISFY ARARS ACROSS THE SITE. GROUND WATER EXTRACTION ALTERNATIVE GWC-2A WOULD SATISFY GROUND WATER ARARS. CONSTRUCTION OF THE GROUND WATER EXTRACTION, TREATMENT, AND DISCHARGE SYSTEM FOR ALTERNATIVE GWC-2A WOULD SATISFY ACTION-SPECIFIC ARARS.

LONG-TERM EFFECTIVENESS AND PERMANENCE

ALTERNATIVE GWC-2A WOULD PERMANENTLY REDUCE THE MAGNITUDE OF POTENTIAL RISKS AT THE SITE THROUGH FUTURE EXPOSURE TO GROUNDWATER. WELL POINT EXTRACTION OF GROUND WATER AND AIR STRIPPING ARE

DEMONSTRATED TECHNOLOGIES THAT CAN BE READILY INSPECTED AND REPAIRED, IF NECESSARY. AIR STRIPPING CAN READILY ACHIEVE THE CONCENTRATIONS NECESSARY FOR DISCHARGE TO SOLOMONS CREEK. PERIODIC SAMPLINGS OF THE TREATED EFFLUENT WOULD BE REQUIRED.

REDUCTION OF TOXICITY, MOBILITY OR VOLUME

THE NO ACTION AND LONG-TERM MONITORING OF GROUNDWATER ALTERNATIVES WOULD NOT SIGNIFICANTLY REDUCE THE TOXICITY, MOBILITY OR VOLUME OF CONTAMINANTS IN GROUND WATER. ALTERNATIVE GWC-2A WOULD PERMANENTLY REDUCE THE MASS OF VOCS IN GROUND WATER.

SHORT-TERM EFFECTIVENESS

NONE OF THE ALTERNATIVES WOULD POSE A RISK TO THE COMMUNITY OR REMEDIAL WORKERS THROUGH IMPLEMENTATION. CONSTRUCTION SCHEDULES FOR THE ALTERNATIVES WOULD BE:

ALTERNATIVE GWC-1A:	NONE
ALTERNATIVE GWC-1B:	1 MONTH
ALTERNATIVE GWC-2A:	4 MONTHS

IMPLEMENTATION OF ALTERNATIVE GWC-2A WOULD REQUIRE APPROXIMATELY 30 YEARS.

IMPLEMENTABILITY

NONE OF THE ALTERNATIVES WOULD POSE ANY SIGNIFICANT DIFFICULTIES REGARDING CONSTRUCTION OPERATION. DESIGN OF ANY TREATMENT SYSTEM COULD NOT BE COMPLETED UNTIL DISCHARGE REQUIREMENTS WERE DEFINED.

COST

TOTAL PRESENT WORTH COSTS FOR THE GROUND WATER CONTROL ALTERNATIVES ARE PRESENTED BELOW:

ALTERNATIVE GWC-1A:	$ 140,000.
ALTERNATIVE GWC-1B:	$1,640,000
ALTERNATIVE GWC-2A:	$6,900,000 (3) YEAR DURATION

B. SOURCE CONTROL

THE FOLLOWING ALTERNATIVES WERE DEVELOPED FOR SITE SOILS AND WERE SUBJECTED TO DETAILED ANALYSIS:

SC-1:	NO ACTION
SC-2:	CAP FORMER LAGOON 7 AND LAGOON 10
SC-3:	SOIL VAPOR EXTRACTION (SVS) FOR LAGOON 7, CAP LAGOON 10
SC-4:	SVE FOR LAGOON 7, BIOREMEDIATION FOR LAGOON 10
SC-5:	SVE FOR LAGOON 7, OFF-SITE DISPOSAL FOR LAGOON 10

A SUMMARY OF THE EVALUATION OF THESE ALTERNATIVES IS PRESENTED BELOW.

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

THE NO ACTION ALTERNATIVE IS NOT PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT AND DOES NOT ASSURE THE ATTAINMENT OF ARARS. CAPPING (ALTERNATIVE SC-2) AND SVE (ALTERNATIVES SC-3, 4, AND 5) WOULD REDUCE CHEMICAL LOADINGS TO GROUND WATER FROM LAGOON 7 AND THEREBY LESSEN ANY RISKS TO POTENTIAL DOWNGRADIENT RECEPTORS IN THE FUTURE. LONG TERM CONTAINMENT OR REMEDIATION OF LAGOON 10 WILL BE NECESSARY TO CONTROL ANY POTENTIAL FUTURE RISK POSED BY THESE WASTES.

COMPLIANCE WITH ARARS

THE ONLY IDENTIFIED ARAR FOR SITE SURFICIAL SOILS ARE THE PROPOSED RCRA CORRECTIVE ACTION LEVELS. THE ONLY SURFICIAL SOIL COMPOUND POSING POTENTIAL RISKS IS ARSENIC, WHOSE MAXIMUM CONCENTRATION WAS SIGNIFICANTLY LESS THAN THE RCRA ACTION LEVEL. CONCENTRATIONS AT THE SITE AND THEREFORE EACH OF THE SOURCE CONTROL ALTERNATIVES, SATISFY THE RCRA ACTION LEVEL.

SOILS AT LAGOON 7 HAVE CAUSED VOCS IN GROUNDWATER TO EXCEED GROUNDWATER REMEDIATION LEVELS. CAPPING AND SVE WOULD SIGNIFICANTLY REDUCE FURTHER LEACHING OF CONTAMINANTS TO GROUND WATER FROM LAGOON 7. THE CAP IN ALTERNATIVE SC-2 AND 3 WOULD BE DESIGNED TO COMPLY WITH RCRA PERFORMANCE STANDARDS. THE SVE SYSTEM IN ALTERNATIVES SC-3, 4, AND 5 WOULD BE OPERATED IN ACCORDANCE WITH NORTH CAROLINA AIR EMISSION REQUIREMENTS. OFF-SITE DISPOSAL (E.G., LANDFILLING) OF SOILS WOULD COMPLY WITH EPA'S OFF-SITE POLICY AND LAND DISPOSAL RESTRICTIONS (ALTERNATIVE SC-5).

LONG-TERM EFFECTIVENESS AND PERMANENCE

BASED ON THE VIP MODEL, PCE IS THE ONLY COMPOUND FOUND IN SITE SOILS WITH THE POTENTIAL TO IMPACT GROUNDWATER ABOVE REMEDIATION LEVELS. THE MIGRATION OF PCE TO GROUNDWATER FROM LAGOON 7 WOULD BE PERMANENTLY CONTROLLED BY CAPPING AND SVE. THE NET REDUCTION IN CHEMICAL RESIDUAL THROUGH BIOREMEDIATION (ALTERNATIVE SC-4) WOULD REQUIRE A TREATABILITY STUDY.

REDUCTION OF TOXICITY, MOBILITY OR VOLUME

THE NO ACTION ALTERNATIVE WOULD NOT SIGNIFICANTLY REDUCE THE TOXICITY, MOBILITY OR VOLUME OF REMAINING SITE RESIDUALS. CAPPING WOULD SIGNIFICANTLY REDUCE THE MOBILITY OF SITE RESIDUALS. SVE WOULD SIGNIFICANTLY REDUCE THE VOLUME OF SITE RESIDUALS THAT COULD IMPACT GROUNDWATER ABOVE REMEDIATION LEVELS.

BIOREMEDIATION WOULD EFFECT A PERMANENT BUT UNDETERMINED REDUCTION IN THE VOLUME OF CHEMICAL RESIDUALS IN LAGOON 10. THE VOLUME OF CHEMICAL RESIDUALS AT THE SITE WOULD BE SIGNIFICANTLY REDUCED THROUGH OFF-SITE LANDFILLING OF LAGOON 10 WASTE MATERIALS.

SHORT-TERM EFFECTIVENESS

NONE OF THE ALTERNATIVES WOULD POSE A RISK TO THE COMMUNITY OR REMEDIAL WORKER THROUGH IMPLEMENTATION. CONSTRUCTION AND OPERATION SCHEDULES FOR THE ALTERNATIVES WOULD BE:

ALTERNATIVE SC-1:	0 MONTHS
ALTERNATIVE SC-2:	3 MONTHS
ALTERNATIVE SC-3:	6-12 MONTHS
ALTERNATIVE SC-4:	25-31 MONTHS
ALTERNATIVE SC-5:	2 MONTHS

IMPLEMENTABILITY

NONE OF THE ALTERNATIVE WOULD POSE ANY SIGNIFICANT CONSTRUCTION NOR OPERATIONAL DIFFICULTIES, ALTHOUGH PERIODIC INSPECTIONS AND REPAIR OF THE CAP(S) WOULD BE REQUIRED. ACTUAL IMPLEMENTATION REQUIREMENTS, FOR BIOREMEDIATION WOULD BE ESTABLISHED THROUGH TREATABILITY TESTING.

COST

TOTAL PRESENT WORTH COSTS FOR THE SOURCE CONTROL ALTERNATIVES ARE PRESENTED BELOW:

ALTERNATIVE SC-1:	$ 190,000
ALTERNATIVE SC-2:	$ 690,000
ALTERNATIVE SC-3:	$1,100,000
ALTERNATIVE SC-4:	$1,500,000
ALTERNATIVE SC-5:	$ 770,000 (HAZARDOUS)
	$ 520,000 (NON-HAZARDOUS)

C. VESSELS

TWO ALTERNATIVES WERE CONSIDERED FOR SITE VESSELS:

V-1:	NO ACTION
V-2:	OFF-SITE DISPOSAL

THE VESSEL ALTERNATIVES ARE COMPARED BELOW.

OVERALL PROTECTION OF HUMAN HEATH AND THE ENVIRONMENT ALTERNATIVE V-1 WOULD NOT ELIMINATE

POTENTIAL RISKS FROM ACCIDENTAL SPILLS OF THE VESSEL CONTENTS OR FROM PHYSICAL INJURY FROM CLIMBING ON THE VESSELS WHEREAS ALTERNATIVE V-2 WOULD.

COMPLIANCE WITH ARARS

RCRA REGULATIONS WERE IDENTIFIED AS POTENTIALLY RELEVANT AND APPROPRIATE ARARS FOR OFF-SITE DISPOSAL OF VESSEL CONTENTS. THIS ACTION-SPECIFIC ARAR FOR OFF-SITE DISPOSAL, HOWEVER, IS NOT AN ARAR UNDER THE NO ACTION ALTERNATIVE. CONSEQUENTLY, THIS ALTERNATIVE WOULD NOT VIOLATE ANY IDENTIFIED ARARS.

ALTERNATIVE V-2 WOULD FOLLOW APPROPRIATE RCRA, OSHA, NESHAP, AND NORTH CAROLINA REQUIREMENTS AND THEREFORE WOULD COMPLY WITH THESE POTENTIAL ARARS.

LONG-TERM EFFECTIVENESS AND PERMANENCE

SINCE THE VESSELS AND THEIR CONTENTS WOULD NOT BE ADDRESSED UNDER ALTERNATIVE V-1, ANY POTENTIAL RISKS WOULD REMAIN. PERIODIC INSPECTIONS WOULD BE REQUIRED TO EVALUATE CONTAINMENT OF THE VESSEL RESIDUALS. A FIVE-YEAR REVIEW OF REMEDY WOULD BE REQUIRED SINCE WASTE MATERIALS WOULD REMAIN AT THE SITE.

SINCE THE VESSELS AND THEIR CONTENTS WOULD BE TAKEN OFF-SITE AND RECYCLED OR DISPOSED (WITH THE POSSIBLE EXCEPTION OF THE TANKERS), THERE WOULD BE NO RESIDUAL RISK FOLLOWING IMPLEMENTATION OF ALTERNATIVE V-2. SINCE THE TANKERS CONTAIN SOLIDS OR TAR THAT ARE NOT HAZARDOUS ACCORDING TO RCRA TOXICITY CHARACTERISTICS, AND WOULD BE DIFFICULT TO CLEAN BECAUSE OF THE TAR AND SOLIDS RESIDUES, OFF-SITE BURIAL AT AN INDUSTRIAL LANDFILL (NON-HAZARDOUS) WOULD BE FEASIBLE.

REDUCTION OF TOXICITY, MOBILITY, AND VOLUME

THERE WOULD BE NO REDUCTION IN TOXICITY OR MOBILITY OF THE VESSEL CONTENTS UNDER ALTERNATIVE V-1. THE VOLUME OF WASTES IN THE VESSELS MAY FLUCTUATE SOME DEPENDING ON RAINWATER INFLUX AND EVAPORATION OF OIL AND WATER.

THE VOLUME AND TOXICITY OF MATERIALS AT THE SITE WOULD BE PERMANENTLY REDUCED UNDER ALTERNATIVE V-2. INCINERATION (HAZARDOUS MATERIALS) OR RECYCLING (NON-HAZARDOUS) WOULD EFFECT A PERMANENT REDUCTION IN THE ABSOLUTE VOLUME OF VESSEL CONTENTS.

SHORT-TERM EFFECTIVENESS

NO ACTION WOULD NOT ELIMINATE POTENTIAL RISKS TO THE COMMUNITY OR THE ENVIRONMENT DURING IMPLEMENTATION. NO ACTION CAN BE IMPLEMENTED IMMEDIATELY.

VESSEL REMOVAL IS ESTIMATED TO TAKE 2 MONTHS. SHORT TERM RISKS INVOLVED IN THIS ALTERNATIVE WOULD BE FROM CUTTING TO DISMANTLE THE VESSELS AND IN MOVING THE SITE VESSELS. OTHER RISKS COULD RESULT FROM THE REMOVAL OF THE SOLIDS FROM VAT 4 BECAUSE OF THE DUST THAT COULD BE GENERATED, AND FROM REMOVAL OF THE BOILER IF IT IS FOUND TO CONTAIN FRIABLE ASBESTOS. HOWEVER, THE LOW AMOUNT OF LEAD AND THE SMALL VOLUME OF SOLIDS IN VAT 4 WOULD MINIMIZE ANY EFFECTS FROM THE DUST. DUST CONTROL AND AMBIENT AIR MONITORING WOULD BE CONDUCTED TO MINIMIZE POTENTIAL RISKS TO THE COMMUNITY. POTENTIAL WORKER EXPOSURE WOULD BE REDUCED BY USING THE APPROPRIATE PERSONAL PROTECTIVE EQUIPMENTS AS DIRECTED BY THE REMEDIAL HEALTH AND SAFETY PLAN.

IMPLEMENTABILITY

CONSIDERATION OF IMPLEMENTABILITY IS NOT APPLICABLE SINCE THE VESSELS WOULD NOT BE ADDRESSED UNDER THE NO ACTION ALTERNATIVE (V-1).

CLEANING AND REMOVAL OF WASTE STORAGE TANKS HAS BEEN SUCCESSFULLY ACCOMPLISHED AT NUMEROUS HAZARDOUS WASTE SITES AND THERE ARE NO SPECIAL REQUIREMENTS AT THIS SITE THAT WOULD LEAD TO IMPLEMENTATION CONCERNS. THERE ARE A NUMBER OF QUALIFIED COMPANIES THAT SPECIALIZE IN THIS TYPE OF REMEDIAL WORK. TRANSFERRING THE VESSEL CONTENTS AND DISMANTLING THE VESSELS WOULD BE READILY IMPLEMENTED.

COST

TOTAL PRESENT WORTH COSTS FOR THE VESSEL ALTERNATIVES ARE PRESENTED BELOW:

ALTERNATIVE V-1:	$ 90,000
ALTERNATIVE V-2:	$ 300,000

D. MODIFYING CRITERIA

STATE AND COMMUNITY ACCEPTANCE ARE MODIFYING CRITERIA THAT SHALL BE CONSIDERED IN SELECTING THE REMEDIAL ACTION.

STATE ACCEPTANCE

THE STATE OF NORTH CAROLINA CONCURS WITH THE SELECTED REMEDY.

COMMUNITY ACCEPTANCE

A PROPOSED PLAN FACT SHEET WAS RELEASED TO THE PUBLIC ON JULY 25, 1991. THE PROPOSED PLAN PUBLIC MEETING WAS HELD ON AUGUST 6, 1991.

THE PUBLIC COMMENT PERIOD ON THE PROPOSED PLAN WAS TO BE HELD FROM JULY 25, 1991, TO AUGUST 23, 1991. THE PUBLIC COMMENT PERIOD WAS EXTENDED AN ADDITIONAL 30 DAYS IN RESPONSE TO A REQUEST FOR AN EXTENSION DATED AUGUST 19, 1991 RECEIVED FROM THE PRPS. DUE TO THE LETTER FROM THE PRPS REQUESTING AN EXTENSION, THE PUBLIC COMMENT PERIOD DID NOT END UNTIL SEPTEMBER 23, 1991.

TWO LETTERS AND ONE SET OF WRITTEN COMMENTS WERE RECEIVED DURING THE PUBLIC COMMENT PERIOD. THESE LETTERS, COMMENTS, AND QUESTIONS ASKED DURING THE AUGUST 6 PUBLIC MEETING ARE SUMMARIZED IN THE ATTACHED RESPONSIVENESS SUMMARY.

#SR
10. SELECTED REMEDY

SECTION 121 OF CERCLA, AS AMENDED, 42 USC S 9621, AND THE NATIONAL OIL AND HAZARDOUS SUBSTANCE POLLUTION CONTINGENCY PLAN (NCP) ESTABLISH A VARIETY OF REQUIREMENTS RELATING TO THE SELECTION OF THE REMEDIAL ACTION UNDER CERCLA. HAVING APPLIED THE EVALUATION CRITERIA TO THE THREE POTENTIAL REMEDIAL ALTERNATIVES TO ADDRESS GROUNDWATER CONTROL, FIVE POTENTIAL REMEDIAL ALTERNATIVES TO ADDRESS SOURCE CONTROL, AND TWO ALTERNATIVES TO ADDRESS VESSELS, EPA HAS SELECTED THE FOLLOWING REMEDY FOR THE MACON/DOCKERY SITE.

GROUND WATER CONTROL

GWC-2A RECOVERY AND TREATMENT OF ALL SITE GROUNDWATER EXCEEDING GROUNDWATER REMEDIATION LEVELS USING AIR STRIPPING, COAGULATION/FILTRATION

SOURCE CONTROL

SC-4 SOIL VAPOR EXTRACTION (SVE) FOR LAGOON 7, BIOREMEDIATION FOR LAGOON 10

VESSELS

V-2 OFF-SITE. DISPOSAL

A DESCRIPTION OF THE SELECTED REMEDIES CAN BE FOUND IN SECTION 8 OF THE ROD.

A. GROUNDWATER EXTRACTION, TREATMENT, AND DISCHARGE

THIS REMEDIAL ACTION WILL CONSIST OF A GROUNDWATER EXTRACTION AND TREATMENT SYSTEM, AND AN OVERALL MONITORING PROGRAM FOR THE SITE. GROUNDWATER CONTAMINATED ABOVE THE REMEDIATION LEVELS INDICATED IN TABLE 57 WILL BE EXTRACTED ACROSS THE ENTIRE SITE. THIS WILL BE ACCOMPLISHED BY INSTALLING A SERIES OF EXTRACTION WELLS LOCATED WITHIN AND AT THE PERIPHERY OF THE CONTAMINANT PLUME IN THE AQUIFER.

THE ESTIMATED TOTAL VOLUMETRIC FLOW IS 57,600 GALLONS PER DAY. THIS IS BASED ON A 40 GPM GROUNDWATER EXTRACTION SYSTEM OPERATING 24 HOURS A DAY. MORE PRECISE GROUNDWATER WITHDRAWAL

AND DISCHARGE VALUES WILL BE DEVELOPED AS PART OF THE REMEDIAL DESIGN. AS STATED PREVIOUSLY, THE POINT OF COMPLIANCE IS THE ENTIRE SITE.

THE EXTRACTION SYSTEM WILL BE DEVELOPED IN THE REMEDIAL DESIGN. IT IS ANTICIPATED THAT 12 EXTRACTION WELLS WILL BE NEEDED (REFER TO FIGURE 8 AND 9). ADDITIONAL MONITORING WELLS, PUMP TESTS AND GROUNDWATER MODELING MAY BE REQUIRED FOR THE DESIGN OF THE EXTRACTION SYSTEM.

TREATMENT OF GROUNDWATER WILL BE ACCOMPLISHED BY MEANS OF AN AIR STRIPPING TOWER. FROM THE EXTRACTION WELLS, GROUNDWATER WILL BE PUMPED INTO AN EQUALIZATION TANK BEFORE IT IS FED TO THE AIR STRIPPING SYSTEM. THE AIR STRIPPER WILL REMOVE THE VOCS FROM THE GROUNDWATER. DISCHARGE OF TREATED GROUNDWATER WILL BE EITHER TO A SURFACE WATER (SOLOMONS CREEK) OR TO AN INFILTRATION GALLERY. IF THE TREATED GROUNDWATER MEETS STANDARDS TO BE SPECIFIED IN THE NPDES DISCHARGE PERMIT, IT WILL BE DISCHARGED TO SOLOMONS CREEK. ON-SITE DISCHARGE TO AN INFILTRATION GALLERY WOULD HAVE TO COMPLY WITH THE SUBSTANTIVE REQUIREMENTS OF A NON-DISCHARGE PERMIT (15A NCAC 2H.0200) AS ADMINISTERED BY THE STATE OF NORTH CAROLINA. DUE TO THE POTENTIAL OF HAVING CONCENTRATIONS OF METALS ABOVE ALLOWABLE LEVELS IN THE EFFLUENT UNDER THE NPDES PROGRAM, IT MAY BE NECESSARY TO REDUCE METAL CONCENTRATIONS IN THE GROUNDWATER PRIOR TO DISCHARGE. METAL REMOVAL FROM THE GROUNDWATER MAY CONSIST OF FILTRATION/COAGULATION OR SOME OTHER COST EFFECTIVE METHOD.

THE FOLLOWING DETAILS WILL NEED TO BE ADDRESSED AS PART OF THE REMEDIAL DESIGN: (1) THE NEED TO REMOVE METALS FROM THE EXTRACTED GROUNDWATER PRIOR TO DISCHARGING TO SOLOMONS CREEK OR AN INFILTRATION GALLERY; (2) THE DISPOSAL OF ANY WASTE STREAM ASSOCIATED WITH THE REMOVAL OF METALS; AND (3) THE NEED FOR CONTROLLING THE OFF-GAS OF THE AIR STRIPPER. THE NECESSITY FOR REMOVING METALS PRIOR TO DISCHARGING THE TREATED GROUNDWATER TO SOLOMONS CREEK OR AN ON-SITE INFILTRATION GALLERY WILL BE ADDRESSED IN THE PREPARATION FOR OBTAINING THE NPDES DISCHARGE PERMIT OR NON-DISCHARGE PERMIT. DATA GENERATED AS PART OF THE RD WILL ALSO CONFIRM IF THE OFF-GAS FROM THE AIR STRIPPER, LADEN WITH VOLATILES STRIPPED FROM THE GROUNDWATER, WILL NEED TO BE CONTROLLED.

AS STATED PREVIOUSLY, THE GOAL OF THIS REMEDIAL ACTION IS TO RESTORE GROUNDWATER TO ITS BENEFICIAL USE AS A DRINKING WATER SOURCE. BASED ON INFORMATION OBTAINED DURING THE RI AND ON A CAREFUL ANALYSIS OF ALL REMEDIAL ALTERNATIVES, EPA AND THE STATE OF NORTH CAROLINA BELIEVE THAT THE SELECTED REMEDY WILL ACHIEVE THIS GOAL. GROUNDWATER CONTAMINATION MAY BE ESPECIALLY PERSISTENT IN THE IMMEDIATE VICINITY OF THE CONTAMINANTS' SOURCE, WHERE CONCENTRATIONS ARE RELATIVELY HIGH. THE ABILITY TO ACHIEVE CLEANUP GOALS AT ALL POINTS THROUGHOUT THE AREA OF THE PLUME, CANNOT BE DETERMINED UNTIL THE EXTRACTION SYSTEM HAS BEEN IMPLEMENTED, MODIFIED AS NECESSARY, AND PLUME RESPONSE MONITORED OVER TIME. IF THE IMPLEMENTED GROUNDWATER EXTRACTION SYSTEM CANNOT MEET THE SPECIFIED REMEDIATION GOALS, AT ANY OR ALL OF THE MONITORING POINTS DURING IMPLEMENTATION, THE CONTINGENCY MEASURES AND GOALS DESCRIBED BELOW MAY REPLACE THE SELECTED REMEDY AND GOALS FOR THESE PORTIONS OF THE PLUME. SUCH CONTINGENCY MEASURES WILL, AT A MINIMUM, PREVENT FURTHER MIGRATION OF THE PLUM AND INCLUDE A COMBINATION OF CONTAINMENT TECHNOLOGIES AND INSTITUTIONAL CONTROLS. THESE MEASURES ARE CONSIDERED TO BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT AND ARE TECHNICALLY PRACTICABLE UNDER THE CORRESPONDING CIRCUMSTANCES.

THE SELECTED REMEDY WILL INCLUDE GROUNDWATER EXTRACTION FOR AN ESTIMATED PERIOD OF 30 YEARS, DURING WHICH TIME THE SYSTEM'S PERFORMANCE WILL BE CAREFULLY MONITORED ON A REGULAR BASIS AND ADJUSTED AS WARRANTED BY THE PERFORMANCE DATA COLLECTED DURING OPERATION. MODIFICATIONS MAY INCLUDE ANY OR ALL OF THE FOLLOWING:

- ALTERNATING PUMPING AT WELLS TO ELIMINATE STAGNATION POINTS;
- PULSE PUMPING TO ALLOW AQUIFER EQUILIBRATION AND TO ALLOW ADSORBED CONTAMINANTS TO PARTITION INTO GROUNDWATER;
- INSTALLATION OF ADDITIONAL EXTRACTION WELLS TO FACILITATE OR ACCELERATE CLEANUP OF THE CONTAMINANT PLUME; AND
- AT INDIVIDUAL WELLS WHERE CLEANUP GOALS HAVE BEEN ATTAINED, AND AFTER ANALYTICAL CONFIRMATION, PUMPING MAY BE DISCONTINUED.

TO ENSURE THAT CLEANUP GOALS WILL BE OBTAINED AND MAINTAINED, THE AQUIFER WILL BE MONITORED AT

THOSE WELLS WHERE PUMPING HAS CEASED INITIALLY EVERY YEAR FOLLOWING DISCONTINUATION OF GROUNDWATER EXTRACTION. THIS MONITORING WILL BE INCORPORATED INTO AN OVERALL SITE MONITORING PROGRAM WHICH WILL BE FULLY DELINEATED IN THE OPERATIONS AND MAINTENANCE PORTION OF THE REMEDIAL DESIGN.

IF IT IS DETERMINED, ON THE BASIS OF THE PRECEDING CRITERIA AND THE SYSTEM PERFORMANCE DATA, THAT CERTAIN PORTIONS OF THE AQUIFER CANNOT BE RESTORED TO THEIR BENEFICIAL USE, ALL OF THE FOLLOWING MEASURES INVOLVING LONG-TERM MANAGEMENT MAY OCCUR, FOR AN INDEFINITE PERIOD OF TIME, AS A MODIFICATION OF THE EXISTING SYSTEM:

- ENGINEERING CONTROLS SUCH AS PHYSICAL BARRIERS, OR LONG-TERM GRADIENT CONTROL PROVIDED BY LOW LEVEL PUMPING, AS CONTAINMENT MEASURES;
- CHEMICAL-SPECIFIC ARARS MAY BE WAIVED FOR THE CLEANUP OF THOSE PORTIONS OF THE AQUIFER BASED ON THE TECHNICAL IMPRACTICABILITY OF ACHIEVING FURTHER CONTAINMENT REDUCTION;
- INSTITUTIONAL CONTROLS MAY BE PROVIDED/MAINTAINED TO RESTRICT ACCESS TO THOSE PORTIONS OF THE AQUIFER WHICH REMAIN ABOVE HEALTH-BASED GOALS, SINCE THIS AQUIFER IS CLASSIFIED AS A POTENTIAL DRINKING WATER SOURCE;
- CONTINUED MONITORING OF SPECIFIED WELLS; AND
- PERIODIC REEVALUATION OF REMEDIAL TECHNOLOGIES FOR GROUNDWATER RESTORATION.

THE DECISION TO INVOKE ANY OR ALL OF THESE MEASURES MAY BE MADE DURING A PERIODIC REVIEW OF THE REMEDIAL ACTION, WHICH WILL OCCUR AT INTERVALS OF AT LEAST EVERY FIVE YEARS, IN ACCORDANCE WITH CERCLA 121(C) TO ENSURE STATE AND PUBLIC INVOLVEMENT IN THIS DECISION AT THIS SITE, ANY CHANGES FROM THE REMEDIATION GOALS IDENTIFIED IN THIS ROD WILL BE FORMALIZED IN EITHER AN EXPLANATION OF SIGNIFICANT DIFFERENCE DOCUMENT OR AN AMENDMENT TO THIS RECORD OF DECISION.

B. SOURCE REMEDIATION

SOIL VAPOR EXTRACTION

A SOIL VAPOR EXTRACTION (SVE) SYSTEM IS AN IN-SITU TREATMENT PROCESS USED TO CLEAN UP SOILS THAT CONTAIN VOCS AND SVOCS BY INDUCING A VACUUM IN THE SUBSURFACE SOILS. THE SVE SYSTEM CONSISTS OF A NETWORK OF AIR WITHDRAWAL (OR VACUUM) WELLS INSTALLED IN THE UNSATURATED ZONE. A PUMP AND MANIFOLD SYSTEM OF PVC PIPES IS USED FOR APPLYING A VACUUM ON THE AIR WITHDRAWAL WELLS WHICH FEED INTO AN IN-LINE WATER REMOVAL SYSTEM AND AN IN-LINE VAPOR PHASE CARBON ADSORPTION SYSTEM FOR VOC AND SVOC REMOVAL. THE SUBSURFACE VACUUM PROPAGATES LATERALLY, CAUSING IN-SITU VOLATILIZATION OF COMPOUNDS THAT ARE ADSORBED TO SOILS. VAPORIZED COMPOUNDS AND SUBSURFACE AIR MIGRATE TO THE AIR EXTRACTION WELLS, ESSENTIALLY AIR STRIPPING THE SOILS IN-PLACE.

AT THE MACON/DOCKERY SITE, THE VACUUM WELLS CAN BE INSTALLED VERTICALLY TO THE WATER TABLE AT PREDETERMINED LOCATIONS TO FORM THE EXTRACTION SYSTEM. VERTICAL WELLS WERE SELECTED DUE TO THE DEPTH OF THE SOIL STRATA REQUIRING REMEDIATION, GEOTECHNICAL CONDITIONS, AND THE DEPTH TO GROUNDWATER.

ONCE THE WELL SYSTEM IS INSTALLED AND THE VACUUM BECOMES FULLY ESTABLISHED IN THE SOIL COLUMN, VOCS AND SOME SVOCS ARE DRAWN OUT OF THE SOIL AND THROUGH THE VACUUM WELLS. IN ALL SVE OPERATIONS, THE DAILY REMOVAL RATES DECREASE AS CONTAMINANTS ARE RECOVERED FROM THE SOIL. THIS TREATMENT TECHNOLOGY HAS BEEN PROVEN EFFECTIVE AT TREATING SOILS THAT CONTAIN ELEVATED LEVELS OF ORGANIC CONTAMINANTS.

SVE WOULD BE APPLIED TO FORMER LAGOON 7 FOR THE REMOVAL OF TETRACHLOROETHENE (PCE). BASED ON THE VIP MODELING, PCE IS THE ONLY COMPOUND IN SITE SOILS WITH THE POTENTIAL TO CAUSE GROUND WATER TO EXCEED GROUNDWATER REMEDIATION LEVELS. ALSO BASED ON THE VIP MODELING, TARGET REMEDIATION LEVELS FOR SVE AT THE SITE WOULD BE 3.0 PPM PCE IN THE VADOSE ZONE BENEATH FORMER LAGOON 7 (TABLE 58).

THE APPLICATION OF SVE TO THE UNSATURATED ZONE, REMEDIATION IS A MULTI-STEP PROCESS. SPECIFICALLY, FULL-SCALE VACUUM EXTRACTION SYSTEMS ARE DESIGNED WITH THE AID OF LABORATORY AND

PILOT-SCALE VOC STRIPPING TESTS. FURTHER TESTING WILL BE PERFORMED AS PART OF THE REMEDIAL DESIGN.

THE FINAL DISPOSITION OF THE SPENT ACTIVATED CARBON FROM THE IN-LINE CARBON ADSORPTION SYSTEM WILL BE SPECIFIED IN THE REMEDIAL DESIGN. THE THREE OPTIONS TO BE CONSIDERED ARE: TREATMENT, DISPOSAL AT AN APPROVED HAZARDOUS WASTE LANDFILL OR REGENERATION OF THE CARBON. COMPLIANCE WITH ARARS FOR RCRA, INCLUDING LDRS FOR TREATMENT, STORAGE, AND/OR DISPOSAL OF SPENT CARBON WILL BE REQUIRED AS PART OF THE RD.

BIOREMEDIATION

IMPLEMENTATION OF THE BIOREMEDIATION PHASE OF THIS ALTERNATIVE WOULD BE PRECEDED BY A TREATABILITY STUDY TO DETERMINE IF THE INDIGENOUS MICROBIAL POPULATION IS CAPABLE OF DEGRADING THE PAHS IN LAGOON 10. OTHER OBJECTIVES OF THE TREATABILITY STUDY WOULD INCLUDE:

- DETERMINE THE PERCENTAGE OF ENDOGENOUS MICROORGANISMS CAPABLE OF DEGRADING PAHS;
- DETERMINE WHETHER THE ADDITION OF ACCLIMATED MICROORGANISMS WOULD BE NECESSARY (BIOAUGMENTATION);
- EVALUATE CHEMICAL/PHYSICAL SOIL PARAMETERS (EG, PH, MOISTURE CONTENT, NUTRIENT CONTENT, DISSOLVED OXYGEN CONTENT, ETC.) AND IDENTIFY OPTIMAL CONDITIONS FOR BIOREMEDIATION; AND
- DETERMINE BIODEGRADATION KINETICS AND PROJECT TREATMENT CYCLES.

A TREATABILITY STUDY WORK PLAN WOULD BE SUBMITTED TO EPA FOR APPROVAL PRIOR TO IMPLEMENTATION.

A TREATABILITY STUDY WILL BE CONDUCTED DURING REMEDIAL DESIGN TO DETERMINE THE REQUIREMENTS FOR BIOREMEDIATION. A REMEDIATION LEVEL OF 2.0 PPM (TOTAL CARCINOGENIC PAHS) FOR ALL CONTAMINATED SOIL FROM LAGOON 10 WILL BE REQUIRED PRIOR TO REPLACING ANY RESIDUAL MATERIAL IN THE FINAL DISPOSAL AREA (TABLE 58). FINAL DISPOSAL OF TREATMENT RESIDUALS SHALL BE COORDINATED WITH EPA.

LAGOON 10 WASTES WOULD BE EXCAVATED AND TRANSFERRED TO A LINED WASTE TREATMENT CELL WHERE BIOREMEDIATION WOULD BE CONDUCTED AND MONITORED. THE TREATMENT CELL WOULD BE ENCLOSED WITHIN A GREENHOUSE-TYPE STRUCTURE THAT WOULD SERVE TO MAINTAIN OPTIMUM MICROBIAL GROWTH CONDITIONS AND TO CONTROL ANY AIR EMISSIONS. VAPOR PHASE CARBON ADSORPTION WOULD BE USED, AS NECESSARY, TO CONTROL EMISSION CONCENTRATIONS FROM THE GREENHOUSE. A. 100-FOOT BY 100-FOOT WASTE TREATMENT CELL WOULD BE LINED WITH A 60 MIL-HDPE LINER TO PROVIDE CONTAINMENT OF THE WASTES. A 6-INCH LAYER OF SAND AND/OR GRAVEL WOULD BE PLACED WITHIN THE CELL TO PROVIDE A DRAINAGE LAYER FOR EXCESS MOISTURE. THE WASTE TREATMENT CELL WOULD BE BUILT ON A SLIGHT INCLINE SO THAT EXCESS MOISTURE WOULD GRAVITY DRAIN TO A SUMP AT THE LOW END OF THE CELL. THIS WATER WOULD BE REAPPLIED TO THE WASTES DURING THE NEXT APPLICATION OF NUTRIENTS. FERTILIZER IN THE BOX TRAILER AT THE UPPER ICON SITE WOULD BE EVALUATED AS A POTENTIAL SOURCE OF NUTRIENTS. EXCESS WATER NOT RECYCLED WOULD BE TREATED IN THE GROUND WATER TREATMENT SYSTEM, OR DISPOSED OTHERWISE DEPENDING ON ANY TREATMENT REQUIREMENTS. APPLYING A 6 TO 8 INCH LAYER OF LAGOON SOILS ABOVE THE DRAINAGE LAYER WOULD ACCOMMODATE APPROXIMATELY 200 CUBIC YARDS. ACTUAL TREATMENT DESIGN AND OPERATION WOULD BE ESTABLISHED DURING REMEDIAL DESIGN.

A SIGNIFICANT REDUCTION IN PAH CONCENTRATIONS WOULD BE EXPECTED WITHIN 100 DAYS AFTER TREATMENT BEGINS BASED ON REMEDIATION AT OTHER SITES. THE WASTES WOULD BE SAMPLED FOR VOLATILE AND SEMI-VOLATILE ANALYSIS JUST PRIOR TO TREATMENT AND 100 DAYS INTO TREATMENT TO DETERMINE WHETHER TARGET REMEDIATION LEVELS HAVE BEEN ACHIEVED. PERIODIC MAINTENANCE REQUIREMENTS WOULD INCLUDE TILLING, WATERING, AND FERTILIZATION OF THE WASTES. DETAILS OF TREATMENT CELL CONSTRUCTION AND OPERATION WOULD BE PREPARED DURING REMEDIAL DESIGN.

TREATED WASTES WOULD BE RETURNED TO LAGOON 10 UPON REACHING THE TARGETED REMEDIAL LEVEL THE TREATMENT RESIDUALS WOULD BE COVERED WITH A LOW PERMEABILITY CAP. THE EXISTING CLAY AT LAGOON 10 WOULD BE REPLACED AND RECOMPACTED TO FORM THE CAP. THE TREATMENT CELLS WOULD BE DISMANTLED AND DISPOSED AS NON-HAZARDOUS WASTE. ACTUAL CLOSURE REQUIREMENTS WOULD BE ESTABLISHED DURING REMEDIAL DESIGN.

C. VESSELS REMEDIATION

VESSELS REMEDIATION WOULD INVOLVE TRANSFERRING ALL VESSEL CONTENTS INTO SECURE TRANSPORTATION VEHICLES AND DISMANTLING THE VESSELS. SOME OR ALL OF THE BUILDINGS MAY NEED TO BE DEMOLISHED AND REMOVED DURING REMEDIATION OF THE SITE. ALSO, IF EVIDENCE OF LEAKAGE IS NOTED AFTER THE VESSELS ARE REMOVED, THE REMEDIAL ACTION WILL INCLUDE CLEANUP OF ANY SOILS WHICH HAVE BECOME CONTAMINATED AS A RESULT OF THE LEAK. HAZARDOUS VESSEL CONTENTS WOULD BE TAKEN TO A RCRA-APPROVED FACILITY FOR DISPOSAL. NON-HAZARDOUS VESSEL CONTENTS AND THE VESSEL PIECES WOULD BE RECYCLED OR SENT TO AN INDUSTRIAL LANDFILL FOR DISPOSAL.

HAZARDOUS SOLIDS WOULD BE DRUMMED AND TAKEN TO A RCRA-APPROVED LANDFILL FOR DISPOSAL WHILE THE REMAINING SOLIDS (INCLUDING TAR) WOULD BE DISPOSED AS NON-HAZARDOUS WASTE. WATER WOULD BE SENT THROUGH THE GROUND WATER TREATMENT SYSTEM, OR TAKEN TO THE LOCAL PUBLICLY OWNED TREATMENT WORKS FOR DISPOSAL, PENDING COMPARISON WITH PRETREATMENT REQUIREMENTS. OIL WOULD BE PUMPED INTO TANKER TRUCKS FOR OF OFFSITE RECLAMATION OR INCINERATION. ULTIMATE DISPOSITION OF THE OILS WOULD BE BASED ON THE BULK CONCENTRATIONS IN THE TANKER THAT WOULD BE SENT TO THE RECEIVING FACILITY.

FERTILIZER IN THE BOX TRAILER AND THE BOILER INSULATION WOULD BE DISPOSED OF AS NON-HAZARDOUS WASTE OR RECYCLED. BOILER INSULATION HAS NOT BEEN CHARACTERIZED BUT, BASED ON THE ASSUMED AGE OF CONSTRUCTION, MAY CONTAIN ASBESTOS. CHARACTERIZATION OF THE INSULATION WOULD BE REQUIRED PRIOR TO DISMANTLING THE BOILER. TO BE CONSERVATIVE, IT IS ASSUMED THAT DISPOSAL OF BOILER INSULATION WOULD HAVE TO COMPLY WITH ASBESTOS HANDLING REQUIREMENTS.

ACTUAL REQUIREMENTS FOR VESSEL REMEDIATION WOULD BE ESTABLISHED DURING REMEDIAL DESIGN.

D. ADDITIONAL SAMPLING AND MONITORING

AN ECOLOGICAL ENDANGERMENT ASSESSMENT CONDUCTED FOR THE SITE IDENTIFIED AREAS OF POSSIBLE CONCERN WHICH REQUIRE FURTHER CHARACTERIZATION DURING THE REMEDIAL DESIGN. THE FOLLOWING WORK IS REQUIRED TO ADDRESS THE ECOLOGICAL EFFECTS OF THE CONTAMINATED SURFACE WATER, SEDIMENTS, AND SOILS:

- CONDUCT CHRONIC AQUATIC TOXICITY TESTS FOR LOCATIONS WHERE THE TOXICITY QUOTIENT EXCEEDS ONE;
- COLLECT REPRESENTATIVE BIOTA UPPER CARNIVORE FISH SPECIES, INVERTEBRATE SPECIES;
- CONDUCT SEDIMENT TOXICITY TESTS FOR THOSE LOCATIONS WHERE THE TOXICITY QUOTIENT EXCEED ONE;
- EVALUATE THE POTENTIAL ENVIRONMENTAL EFFECTS OF THE CONTAMINATED SOIL, USING SOIL TOXICITY TESTING, ELUTRIATE TESTING, OR, OTHER APPROPRIATE METHODS.

ACTUAL SAMPLING AND MONITORING REQUIREMENTS WILL BE ESTABLISHED DURING REMEDIAL DESIGN. IF THE RESULTS OF THIS ADDITIONAL TESTING IDENTIFY ADDITIONAL AREAS OF CONCERN, THE SCOPE OF REMEDIATION WILL NOT BE LIMITED, BY THIS ROD.

E. COST

THE TOTAL PRESENT WORTH COST FOR THE SELECTED ALTERNATIVE IS $8,700,000.

THE BREAK DOWN OF THIS COST IS SPECIFIED BELOW.

THE PRESENT WORTH COST FOR THE GROUNDWATER EXTRACTION (40 GPM), AIR STRIPPING, COAGULATION/FILTRATION AND INFILTRATION GALLERY IS APPROXIMATELY $6,900,000. THIS COST INCLUDES A CAPITAL COST OF $1,700,000 FOR-CONSTRUCTION OF THE GROUNDWATER EXTRACTION SYSTEM, THE TREATMENT UNIT, TREATED GROUNDWATER DISCHARGE SYSTEM, AND ALL ASSOCIATED PIPING. THIS COST ALSO INCLUDES EXPENDITURES FOR OPERATION AND MAINTENANCE OF THE SYSTEM OF $5,200,000 FOR 30 YEARS.

THE PRESENT WORTH COST FOR THE SOIL VAPOR EXTRACTION AT FORMER LAGOON 7 AND LAND TREATMENT AT LAGOON 10 IS APPROXIMATELY $1,500,000. THIS COST INCLUDES A CAPITAL COST OF $1,300,000 FOR INSTALLATION OF THE MATERIALS FOR THE BIOREMEDIATION TREATMENT CELL, SVE EXTRACTION WELLS, MANIFOLD PIPING, AND POTENTIALLY A CLAY CAP FOR LAGOON 10 RESIDUALS. THIS COST ALSO INCLUDES EXPENDITURES FOR OPERATION AND MAINTENANCE OF THE SYSTEM OF $200,000 FOR 30 YEARS; SVE - 1 YEAR.

THE PRESENT WORTH COST FOR THE OFF-SITE DISPOSAL OF VESSELS IS APPROXIMATELY $300,000. THIS COST INCLUDES A CAPITAL COST OF $300,000 FOR VESSEL DEMOLITION AND WASTE DISPOSAL, FERTILIZER REMOVAL, TRAILER DISPOSAL AND BOILER REMOVAL AND DISPOSAL. THIS COST INCLUDES NO ANNUAL EXPENDITURES FOR OPERATION AND MAINTENANCE $0.00.

CAPITAL COST FOR GROUNDWATER EXTRACTION AND TREATMENT SYSTEM	$1,700,000.00
OPERATION & MAINTENANCE COSTS FOR 30 YEARS	$5,200,000.00
CAPITAL COST FOR THE SVE SYSTEM AND LAND TREATMENT	$1,300,000.00
OPERATION & MAINTENANCE COSTS FOR 30 YEARS; SVE - 1 YEAR	$ 200,000.00
CAPITAL COST FOR OFF-SITE DISPOSAL OF VESSELS	$ 300,000.00
OPERATION & MAINTENANCE COSTS FOR DISPOSAL OF VESSELS	$ 0.00
TOTAL PRESENT WORTH COST	$8,700,000.00

#SD

11. STATUTORY DETERMINATIONS

UNDER ITS LEGAL AUTHORITIES, EPA'S PRIMARY RESPONSIBILITY AT SUPERFUND SITES IS TO UNDERTAKE REMEDIAL ACTIONS THAT ACHIEVE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT. IN ADDITION, SECTION 121 OF CERCLA, 42 USC S 9621, ESTABLISHES SEVERAL OTHER STATUTORY REQUIREMENTS AND PREFERENCES. THESE SPECIFY THAT WHEN COMPLETE, THE SELECTED REMEDIAL ACTION FOR THIS SITE MUST COMPLY WITH APPLICABLE OR RELEVANT AND APPROPRIATE ENVIRONMENTAL STANDARDS ESTABLISHED UNDER FEDERAL AND STATE ENVIRONMENTAL LAWS UNLESS A STATUTORY WAIVER IS JUSTIFIED. THE SELECTED REMEDY ALSO MUST BE COST-EFFECTIVE AND UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE. FINALLY, THE STATUTE INCLUDES A PREFERENCE FOR REMEDIES THAT EMPLOY TREATMENT THAT PERMANENTLY AND SIGNIFICANTLY REDUCE THE VOLUME, TOXICITY, OR MOBILITY OF HAZARDOUS WASTES AS THEIR PRINCIPAL ELEMENT. THE FOLLOWING SECTIONS DISCUSS HOW THE SELECTED REMEDY MEETS THESE STATUTORY REQUIREMENTS.

A. PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

THE SELECTED REMEDY WILL PERMANENTLY TREAT THE GROUNDWATER AND SOIL AND REMOVES OR MINIMIZES THE POTENTIAL RISK ASSOCIATED WITH THE WASTES. DERMAL, INGESTION, AND INHALATION CONTACT WITH SITE CONTAMINANTS WOULD BE ELIMINATED, AND RISKS POSED BY CONTINUED GROUNDWATER CONTAMINATION WOULD BE REDUCED.

B. COMPLIANCE WITH ARARS

THE SELECTED REMEDY WILL COMPLY WITH ALL FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE CHEMICAL-, LOCATION-, AND ACTION-SPECIFIC REQUIREMENTS (ARARS). COMPLIANCE WITH ARARS FOR EACH OF THE COMPONENTS OF THE SELECTED REMEDY IS DISCUSSED BELOW.

GWC-2A: RECOVERY AND TREATMENT OF ALL SITE GROUNDWATER EXCEEDING GROUNDWATER REMEDIATION LEVELS USING AIR TRIPPING, COAGULATION/FILTRATION.

GROUNDWATER REMEDIATION LEVELS (TABLE 57) WOULD BE MET AT THE SITE UNDER THIS ALTERNATIVE. DISCHARGE OF GROUND WATER TO SOLOMONS CREEK WOULD SATISFY AWQC. THIS ALTERNATIVE THEREFORE COMPLIES WITH ARARS.

OFF-SITE DISCHARGE OF TREATED GROUNDWATER TO A SURFACE WATER (SOLOMONS CREEK) WOULD HAVE TO COMPLY WITH THE REQUIREMENTS OF AN NPDES PERMIT. DISCHARGE TO AN INFILTRATION GALLERY WOULD HAVE TO COMPLY WITH THE REQUIREMENTS OF A NON-DISCHARGE PERMIT. AIR STRIPPER EMISSIONS WOULD COMPLY WITH NORTH CAROLINA ALLOWABLE AMBIENT LEVELS. SUBSTANTIVE REQUIREMENTS WOULD BE ESTABLISHED DURING REMEDIAL DESIGN.

SC-4: SOIL VAPOR EXTRACTION (SVE) FOR LAGOON 7, BIOREMEDIATION FOR LAGOON 10

OPERATION OR THE SVE SYSTEM WOULD CONFORM TO NORTH CAROLINA AND EMISSION REQUIREMENTS (15 NCAC 2D.1104). THE REMEDIAL HEALTH AND SAFETY PLAN WOULD CONFORM TO 29 CFR 1910.120.

THERE ARE NO ARARS GOVERNING SUBSURFACE SOILS AT THE SITE. AS DISCUSSED, RCRA LDR ARE NOT ARAR FOR LAND TREATMENT OF LAGOON 10 MATERIALS. BIOREMEDIATION OPERATIONS WOULD CONFORM TO NORTH CAROLINA AIR EMISSION REQUIREMENTS, AS NECESSARY.

V-2: OFF-SITE DISPOSAL

RCRA REGULATIONS WERE IDENTIFIED AS POTENTIALLY RELEVANT AND APPROPRIATE ARARS FOR VESSEL REMEDIATION. RCRA DISPOSAL GUIDANCE WAS IDENTIFIED AS AN ACTION-SPECIFIC ARAR WHILE RCRA HAZARD CHARACTERISTICS WERE IDENTIFIED AS A CHEMICAL-SPECIFIC ARAR (I.E., TCLP). ALTERNATIVE V-2 WOULD FOLLOW APPROPRIATE RCRA REQUIREMENTS AND WOULD THEREFORE COMPLY WITH THESE POTENTIAL ARARS.

IF THE INDUSTRIAL BOILER (BUILDING 2, FIGURE 1) CONTAINS FRIABLE ASBESTOS, THREE POTENTIAL ACTION-SPECIFIC ARARS MAY APPLY FOR OFFSITE DISPOSAL: (1) 29 CFR PARTS 1910.1001 AND 1926.58 (GENERAL ASBESTOS REGULATIONS UNDER THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND CONSTRUCTION/DEMOLITION REGULATIONS, RESPECTIVELY), (2) NORTH CAROLINA SPECIFICATIONS FOR ASBESTOS ABATEMENT (DIVISION OF STATE CONSTRUCTION, DEPARTMENT OF ADMINISTRATION, AS AMENDED IN FEBRUARY 1988) AND (3) 40 CFR PART 61 (CAA) EPA NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP). MOST OF THESE REGULATIONS PERTAIN TO THE PACKING AND SHIPPING OF ASBESTOS-CONTAINING MATERIALS SUCH THAT THE AMOUNT OF ASBESTOS FIBERS ENTERING THE AIR AND AFFECTING POTENTIAL HUMAN EXPOSURE ARE MINIMIZED. ALTERNATIVE V-2 WOULD FOLLOW THE OSHA, NORTH CAROLINA AND EPA REQUIREMENTS AND THEREFORE WOULD COMPLY WITH THESE POTENTIAL ARARS.

C. COST-EFFECTIVENESS

THE SELECTED GROUNDWATER AND SOURCE REMEDIATION TECHNOLOGIES ARE MORE COST-EFFECTIVE THAN THE OTHER ACCEPTABLE ALTERNATIVES CONSIDERED PRIMARILY BECAUSE THEY PROVIDE GREATER BENEFIT FOR THE COST SINCE THEY PROVIDE FOR TREATMENT OF THE WASTE.

D. UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE.

THE SELECTED REMEDY REPRESENTS THE MAXIMUM EXTENT TO WHICH PERMANENT SOLUTIONS AND TREATMENT CAN BE PRACTICABLY UTILIZED FOR THIS ACTION. OF THE ALTERNATIVES THAT ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT AND COMPLY WITH ARARS, EPA AND THE STATE HAVE DETERMINED THAT THE SELECTED REMEDY PROVIDES THE BEST BALANCE OF TRADE-OFFS IN TERMS OF LONG-TERM EFFECTIVENESS AND PERMANENCE; REDUCTION IN TOXICITY, MOBILITY OR VOLUME ACHIEVED THROUGH TREATMENT; SHORT-TERM EFFECTIVENESS, IMPLEMENTABILITY, AND COST; STATE AND COMMUNITY ACCEPTANCE; AND THE STATUTORY PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT.

E. PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

THE PREFERENCE FOR TREATMENT IS SATISFIED BY THE US VACUUM EXTRACTION SYSTEM AND BIOREMEDIATION TO REMOVE CONTAMINATION FROM SOIL AT THE SITE AND THE USE OF AIR STRIPPING TO TREAT CONTAMINATED GROUNDWATER AT THE SITE. THE PRINCIPAL THREATS AT THE SITE WILL BE MITIGATED BY USE OF THESE TREATMENT TECHNOLOGIES.